EXHIBIT C

Evaluation of Michigan Congressional and State Legislative District Plans

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I. Introduction

I have been asked by counsel in this case to evaluate whether, in my opinion, the redistricting plans for the U.S. House of Representatives, State Senate, and State House of Representatives enacted by the Michigan state legislature after the 2010 Census constituted an extreme partisan gerrymander.

This report contains my opinions on these matters. To develop these opinions, I have relied on the technical and specialized knowledge I have gained from my education, training, and experience; widely accepted and reliable statistical methods; and my knowledge of the academic literature on redistricting and metrics for assessing the partisan nature of redistricting plans. My opinions are based on review and analysis of the following information and materials:

- Election results publicly reported by the Michigan Secretary of State from 2012-2016.
- A block-level file of stipulated data, consisting of 2010 Census population; VTD (precinct) assignments; district assignments for the U.S. House, Michigan State Senate, and Michigan State House; and election results consisting of votes cast for Republicans and Democrats in all statewide partisan elections.
- Aggregations of statewide partisan elections held between 2006 and 2010, and between 2012-2016.
- Block-level data files assigning each block to U.S. House, Michigan State Senate, and Michigan State House districts in demonstration maps.
- The academic peer-reviewed literature cited in this report.

II. Background and Qualifications

I have a Ph.D. in political science from Yale University, where my graduate training included courses in econometrics and statistics. My undergraduate degree is from the University of California, San Diego, where I majored in political science and minored in

applied mathematics. I have been on the faculty at the University of Wisconsin-Madison since August 1989. My curriculum vitae is attached to this report as Appendix B.

All publications that I have authored and published in the past ten years appear in my curriculum vitae, attached as Appendix 1. Those publications include the following peer-reviewed journals: *Journal of Politics*, *American Journal of Political Science*, *Election Law Journal*, *Legislative Studies Quarterly*, *Presidential Studies Quarterly*, *American Politics Research*, *Congress and the Presidency*, *Public Administration Review*, *Political Research Quarterly*, and *PS: Political Science and Politics*. I have also published in law reviews, including the *Richmond Law Review*, the *UCLA Pacific Basin Law Journal*, and the *University of Utah Law Review*. My work on campaign finance has been published in *Legislative Studies Quarterly*, *Regulation*, *PS: Political Science and Politics*, *Richmond Law Review*, the Democratic Audit of Australia, and in an edited volume on electoral competitiveness published by the Brookings Institution Press. My research on campaign finance has been cited by the U.S. Government Accountability Office, and by legislative research offices in Connecticut and Wisconsin.

My work on election administration has been published in the *Election Law Journal*, *American Journal of Political Science*, *Public Administration Review*, *Political Research Quarterly*, and *American Politics Research*. I was part of a research group retained by the Wisconsin Government Accountability Board to review their compliance with federal mandates and reporting systems, and to survey local election officials throughout the state. I serve on the Steering Committee of the Wisconsin Elections Research Center, a unit with the UW-Madison College of Letters and Science. In 2012 I was retained by the U.S. Department of Justice to analyze data and methods regarding Florida's efforts to identify and remove claimed ineligible noncitizens from the statewide file of registered voters.

In the past eight years, I have testified as an expert witness in trial or deposition in the following cases:

Federal: *One Wis. Institute, Inc. v. Thomsen* 198 F. Supp. 3d 896 (W.D. Wis. 2016); *Whitford v. Gill*, 218 F. Supp. 3d 837 (W.D. Wis. 2016); *Baldus v. Brennan*, 849 F. Supp. 2d 840 (E.D.

Wis. 2012); *McComish v. Brewer*, No. CV-08-1550, 2010 WL 2292213 (D. Ariz. 2010). State: *Milwaukee Branch of the NAACP v. Walker*, 2014 WI 98, 357 Wis. 2d 469, 851 N.W. 2d 262 (Wis. Circuit Ct., 2012); *Kenosha Cnty. v. City of Kenosha*, No. 11-CV-1813 (Wis. Circuit Ct., Kenosha, WI, 2011).

I am being compensated at a rate of $300 per hour.

III. Opinions

A. Summary

- By every metric used to evaluate the partisan effects of district plans and detect the presence of partisan gerrymandering – partisan bias, seat-bias, vote-bias, partisan symmetry, the Efficiency Gap, mean-median, and declination – the Michigan district plans for all levels of elected offices are extreme gerrymanders.

- The partisan nature of these plans is not due to the existence of majority-minority districts required for compliance with the Voting Rights Act. Even when these districts are excluded from the analysis, all metrics continue to show that the plans are extreme gerrymanders.

- The demonstration plans are much more balanced, and to the extent that partisan bias remains, it is due to the competitiveness of the districts in the plan and the existence of majority-minority districts. When the majority-minority districts are excluded from the analysis, the metrics become mixed, with most showing no evidence of partisan gerrymandering.

B. Definition of Gerrymandering

Gerrymandering is the practice of strategically drawing legislative districts – "the political manipulation of legislative district boundaries" (Ansolabehere and Palmer 2016, 742) – to achieve an intentional political outcome. In the contemporary context it is most often used to describe *partisan* gerrymandering, where the political party that controls the redistricting process draws district boundaries to give it an advantage over the other political party, primarily by creating districts that more efficiently translate votes into seats.

A party's ability to strategically draw district lines to its own advantage stems from the central characteristic of single-member electoral systems: aggregating votes into legislative districts. In single member winner take all plurality systems, the candidate who receives the most votes in a district wins and becomes the representative of that district. In this way, votes (individual-level preferences) are translated into seats (district-level vote aggregations, which determine who wins in each district). These district-level aggregations further generate a jurisdiction-wide result, which is the number of seats controlled by a party in a legislature. Across all districts in a legislative body, the distribution of voters translates into district-level results that produce a set of winners – the candidates who receive the most votes in each district.

The manner in which votes are aggregated matters, because a candidate who wins with 53% or 55% of the vote is just as "elected" as a one who wins with 90% or 100%. Because 90% or 100% of the vote is not necessary to win a seat (53% or 55%, or even 50% + 1 vote will suffice), the party that draws district lines can redistribute voters so that its votes are more efficiently translated into seats. Different district-level aggregations of votes can change the number of seats those votes produce, even if individual votes do not change.

Partisan gerrymandering is the practice of drawing those lines so that a party wins a larger number and share of seats than it would have won under non-gerrymandered lines. At the extreme, a party that held a narrow majority in overall statewide partisan preferences (say, 53%) could in theory draw district lines so that it wins *all* of the seats in a legislature, with 53% of the vote in every district.

In drawing district lines, map drawers are constrained by constitutional, jurisprudential, and statutory requirements (which are often collectively described as "traditional

redistricting principles"): equal population, contiguity, compactness, respect for political subdivision boundaries, and compliance with the Voting Rights Act.[1]

1. Examples

The following example, patterned after Bullock (2010, 17), demonstrates how the same voters can produce different outcomes conditional on how they are distributed. Assume a legislature in a state comprised of 5 districts with 100 voters each, two political parties (A and B), and single member plurality rule. The candidate who receives the most votes (defined here as >50) wins the seat. In the first case, the districts are as follows:

Table 1

District	Vote for Party A	Vote for Party B	Winner
1	45	55	B
2	55	45	A
3	40	60	B
4	70	30	A
5	70	30	A
Total Votes	280	220	

Party A wins 56 % of the aggregated statewide vote, 280 votes out of 500, and wins 60% of seats (3 of 5) with majorities in districts 2, 4, and 5.

Those same voters can be redrawn into a different set of districts with the following district vote totals:

Table 2

[1] Additional criteria, at times included in state constitutions or statutes, include preserving communities of interest, core district retention, and in a few instances creating electorally competitive districts or specifically protecting incumbents. See National Conference of State Legislatures, Redistricting Criteria http://www.ncsl.org/research/redistricting/redistricting-criteria.aspx.

District	Vote for Party A	Vote for Party B	Winner
1	75	25	A
2	55	45	A
3	10	90	B
4	70	30	A
5	70	30	A
Total Votes	280	220	

Statewide, the number of voters who support party A statewide has not changed, and remains at 56%. But now, A wins 80% of seats (4 of 5), through the more efficient allocation of its supporters. By concentrating B votes into district 3 where they constitute an overwhelming majority, A secures an additional seat. The 90 B votes in district 3 are far more than necessary to win the seat (51 votes), and the 20 to 45 B votes in the other 4 districts not enough to win in any of them. A achieves this by moving 30 B votes from district 1 into district 3, and 30 A votes from district 3 to district 1, thereby changing a 55-45 victory for party B in district 1 into a 75-25 victory for A. The additional 30 B voters in district 3 do not change the result there, because B wins in both cases (with 60 votes in the first example and 90 in the second).

Districts can even be drawn to secure a legislative majority for B even though A wins a majority of the statewide vote:

Table 3			
District	Vote for Party A	Vote for Party B	Winner
1	100	0	A
2	45	55	B
3	45	55	B
4	45	55	B
5	45	55	B
Total Votes	280	220	

Now, party A's voters have been concentrated into one district where A wins unanimously, and split among the other four districts so that they constitute minorities in all of them. Through a strategic redistribution, B now wins 4 of 5 districts (80%) even though only it wins only 44% of the statewide vote.

These examples, in which the number of voters for each party are held constant but different district configurations produce different aggregate results, demonstrate the two classic, and reciprocal, gerrymandering techniques: packing and cracking (Owen and Grofman 1982)[2]. Packing involves concentrating a party's supporters into a small number districts where they constitute overwhelming majorities (district 1 in the last example above). Cracking involves distributing a party's supporters voters in such a way that they constitute minorities in other districts (districts 2-4 in the last example). The common thread that links the two techniques is the efficiency with which each side's voters are aggregated into seats. For the controlling party, its voters are aggregated in a way that produces additional seats, primarily by distributing votes into districts where the party wins by comfortable, but not huge margins. For the disadvantaged party, its voters are concentrated into fewer districts with overwhelming margins, with the remainder spread over other districts where they constitute minorities.

The defining characteristic of a partisan gerrymander is that it allows a political party to win more seats than it would have to if districts were drawn in a neutral fashion. "Neutral" in this context means districts drawn in accordance with traditional redistricting criteria without regard to partisanship: equal population, contiguity, compactness, preservation of political subdivisions, and compliance with Voting Rights Act.

[2] Owen and Grofman use different terminology, "concentration" and "dispersal" though the meanings are the same (1982, 6). The Supreme Court in *Davis v. Bandemer*, 478 U.S. 109, 117, 180 (1986)used the terms "stacking" and "splitting."

2. Effects of Partisan Gerrymandering

Although partisan gerrymandering has a long history, it is almost never defended in the abstract; normatively the practice is universally considered to be unfair, and bas become synonymous with an unwarranted or undeserved electoral advantage.

Tufte, writing in 1973, argued that any electoral system had to pass "two tests if [it] is to be minimally democratic: (1) The districting should yield an electoral system that is responsive to changes in votes. If many citizens shift their votes from one party to another, then the advantaged party should win an increased share of legislative seats. (2) The districting should be relatively unbiased with respect to political party; the electoral system should treat Democrats and Republicans alike" (1973, 553).

The primary effect of gerrymandering is that it violates both principles. It disrupts the relationship between the number of votes a party receives and the number of seats it wins, and violates the core democratic principle that the two quantities should be related (even though the goal is not proportional representation), in the sense that when the number of votes changes, the number of seats should change in the same direction. It distorts the relationship between support in the electorate and the size of a legislative majority, and frequently violates the majoritarian principle, because a political party can win a majority or supermajority of legislative seats even though it receives less than 50% of the overall vote. This violation is the aggregate equivalent to requiring one party to win more than 50% of the vote in order to secure a seat.

It makes election results, and therefore legislative membership, unresponsive to changes in electoral support, as decreases in support for the controlling party do not translate into reductions in the number of seats it wins, nor do increases in support for the non-controlling party translate into increases in the number of seats.

And because partisan gerrymandering, by definition, produces bias and asymmetry, it treats the parties differently, and therefore treats voters differently depending on their vote choices.

C. Identifying Partisan Gerrymandering

The political science literature offers a number of metrics to assess the degree of partisan gerrymandering in a district plan. What most measures have in common is that they capture the degree to which parties (and voters) are treated differently, based on the difference in how efficiently votes are converted to seats.

1. Seats-Votes Curves

As a first cut, we consider a direct measure of how votes translate into seats, using a seats-votes curve that plots the percentage of seats a party controls plotted as a function of its share of the overall vote summed across all districts. Seats-votes curves can be generated empirically, using actual election results over time for any legislature (Tufte 1973), or using predictive tools that forecast the number of seats a party will control under different statewide votes. Since the nature of the curve is a function of how legislative district lines are drawn, seats-votes curves are used to compare the characteristics of different redistricting plans.

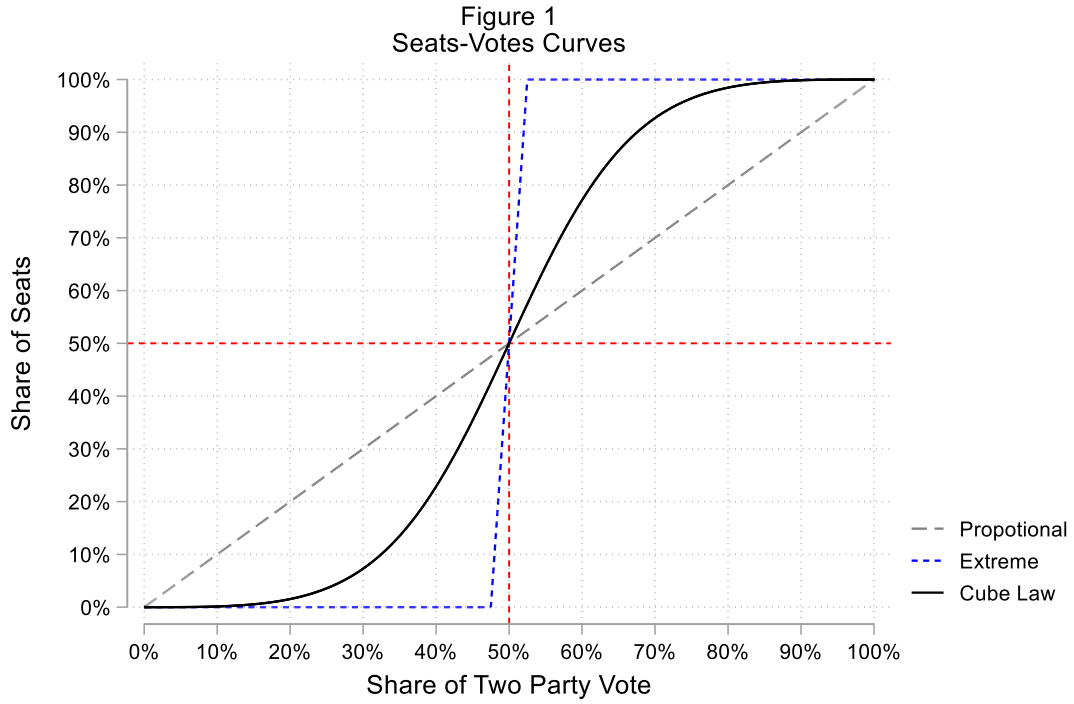

Figure 1 shows three possible curves, each representing different electoral systems. In a system that is exactly proportional, a party's share of seats will always be equal to its share of the vote: a party that wins 40% of the aggregate vote would win 40% of the seats; 60% of the vote would lead to 60% of the seats, and so on. This linear relationship is captured in the dotted gray line, which has a constant slope of 1.

Another possibility is a system in which a party wins no seats until its overall vote share approaches 50%, at which point its seat share rises very rapidly until it controls 100% of seats at just over 50%. This is shown in the dotted blue line.

In practice, the relationship between seats and votes is neither proportional nor linear across all vote shares. The most commonly identified relationship is the so-called "cube law" (Kendall and Stuart 1950), positing an S-shaped curve (the solid black line in the graph).[3] Under the cube law, a party does not win many additional seats if its overall vote

[3] Formally, this is expressed as

$$\frac{S}{1-S} = \left(\frac{V}{1-V}\right)^{b}$$

share increase from, say, 10 to 30 percent (its seat share increases from near zero to just over 7%, whereas under a perfectly proportional relationship its share would rise from 10% to 30%). The change in seats – as measured by the slope of the curve – increases markedly as we approach the 50% vote point: increasing vote share from 30% to 50% increases the seat share from 7% to 50%.[4]

The responsiveness of an electoral system reflects how seat share changes along with overall vote share. In an unresponsive system, an increase in vote share will not result in a party winning more seats, or will require a party to win a large number of additional votes in order to secure a small increase in seat share. This is reflected in the slope of the seats-votes curve, which most often is evaluated in the neighborhood of 50% vote share. In Figure 1, the slope of the cube law curve shows little responsiveness when the vote share is less than 30% or more than 70%, indicating that even a large vote shift (between, say, 0 and 30% or 70% and 100%) does not change the seat share by much. The "extreme" curve shows zero responsiveness between 0-47.5% and 52.5% and 100%, and hyper-responsiveness between 47.5% and 52.5%, when each 1% increase in overall vote share produces a 20% increase in seat share. Responsiveness is often summarized by the "swing ratio," defined as "the change in the proportion of legislative seats won by a party (S), divided by the change in the average district vote (V) received" (Gelman and King, 1990, 276).[5]

A common method of estimating responsiveness is "uniform swing analysis," which changes the vote in each district by a change in the statewide vote percentage. If a party's

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Where V = a party's share of the aggregate two-party vote, and S = the party's share of legislative seats. This is most commonly stated as the ratio of seats held by two parties is equal to the cube of the ratio of the two-party vote, with b=3. In practice, the precise value of *b* is less important than the general pattern of the s-shape (Grofman 1983) and the approximately linear relationship between seats and votes at vote shares close to 50%.

[4] Because the curve is symmetrical, the effects are the same in any interval on either side of 50% - the change in seats from 10% to 30% of the vote is the same as the change from 70% to 90% of the vote.

[5] If turnout is the same in every district, a party's average district vote will be equal to the overall statewide share of the vote received by that party.

statewide vote share increases by 4%, the party's vote share in each district is increased by the same amount. If a party's vote share in a district moves from below 50% to above (from, say, 47% to 51%), it wins that district and picks up the additional seat (and vice versa). The process is repeated in every district, and the winners in each identified. Beginning with an actual set of election results, we can estimate the value of the seats-votes curve at other vote shares, by shifting district level votes up (or down) by a constant value equal to the change in statewide vote percentage. The uniform swing assumption is a reasonable approximation to what actually occurs when aggregate vote shares change (Jackman 2014), and has the advantage of capturing how map drawers themselves evaluate the partisan consequences of different district configurations.[6] Moreover, even when district level swings are not uniform, the *relative* order of districts when sorted by partisanship tends to remain stable from one election to the next (Grofman and King 2007).

A uniform swing analysis also allows the calculation of the aggregate vote share a party would need to win a majority of seats in a legislature. As I describe below, this computation is performed by calculating what vote shift is necessary to flip the median district from the one party to the other, and adding this quantity to the actual statewide vote the minority legislative party received.

2. Baseline Partisanship Measures

Seats-votes curves and other metrics can be used to analyze actual elections or to assess alternative district configurations. The latter requires a somewhat different methodology from counting actual votes, because analyzing an alternative district plan requires more than simply rearranging actual votes into a different set of districts. An incumbent who received 65% of the vote in her last election would likely receive a different percentage of the vote if her district was altered, as new voters placed in the district might not know her

[6] The record in *Whitford v. Gill* showed that the legislative staff who drew the Wisconsin state legislative district map evaluated different map versions using an S-curve estimating the seat distribution at various statewide vote percentages, using a uniform swing method. *Whitford v. Gill* 218 F.Supp.3d 850,851 (W.D. Wis. 2016).

as the incumbent (Ansolabehere, Snyder, and Stewart 2000). Shifting partisans from one district to another will also affect the vote shares candidates receive (indeed, this is the very purpose of partisan gerrymandering).

In addition, election results will not accurately reflect the partisanship of a district if a race is uncontested, because voters have no opportunity to register their support for the party not fielding a candidate. A Republican (or Democratic) candidate running unopposed will receive 100% of the vote, but this does not mean that there are no Democratic (or Republican) voters in that district; rather, it indicates that those preferences are not measured in the vote tally. In the academic redistricting literature, uncontested seats are typically handled by imputing what the vote totals would have been if a race had been contested (Gelman and King 1990; Warrington 2018), or assigning each uncontested race a 75%-25% vote split in favor of the party whose candidate ran unopposed (Gelman and King 1994; Stephanopoulos and McGhee 2015).

A common method of imputation is to use exogenous partisan elections to construct an estimate of baseline district partisanship (McDonald 2014). This method takes advantage of the observed fact that the relationship between partisanship and voting takes a regular and predictable form. Nearly all voters cast their ballots consistently for one party or the other, even if they do not identify as members of that party. One common metric is measuring the degree of "ticket-splitting," in which voters cast their ballots for a presidential candidate of one party, but for congressional candidates for the other. The presidential vote has always been a good predictor of down-ticket voting (especially for non-Southern states), and has become increasingly reliable in recent years as polarization has increased. Jacobson and Carson (2016 , 194) found that ticket splitting in 2012 reached its "lowest levels . . . in five decades."

Statewide and presidential elections, or combined data across different years, are the most common components of such baseline measures (McDonald 2014), as the candidates are the same in every area of a state, and are not affected by specific district-level factors such as incumbency, whether a seat is contested, or local variations in turnout:

> the analysis of election to statewide office aggregated by district holds more probative value than district-specific races as such. This is because gerrymandering via packing often has the byproduct of discouraging turnout in packed districts. In the extreme, packing a district with one set of partisans and then allowing the district to go uncontested can strongly skew the turnout differential in one partisan direction while skewing the asymmetry effect in the other direction. The countervailing tendencies are largely absent for offices contested statewide (president, governor, attorney general, and the like). Statewide elected offices are not subject to the same within-district turnout incentives as the district-specific races and thus provide a cleaner and clearer reading of a gerrymander effect(McDonald and Best 2015, 318)

A properly constructed baseline model using a combination of prior exogenous elections is, for all practical purposes, identical to more complex regression models, and yield similar results for predictive estimates. In *Whitford v. Gill*, I generated baseline partisanship estimates using presidential election results, demographic data, and geographic fixed effects. The district-level measures produced in this method were almost perfectly correlated with a baseline partisanship measure using prior election data (constructed by an expert retained by the Wisconsin legislature to assist with map drawing), with an r=0.98.[7]

3. Metrics

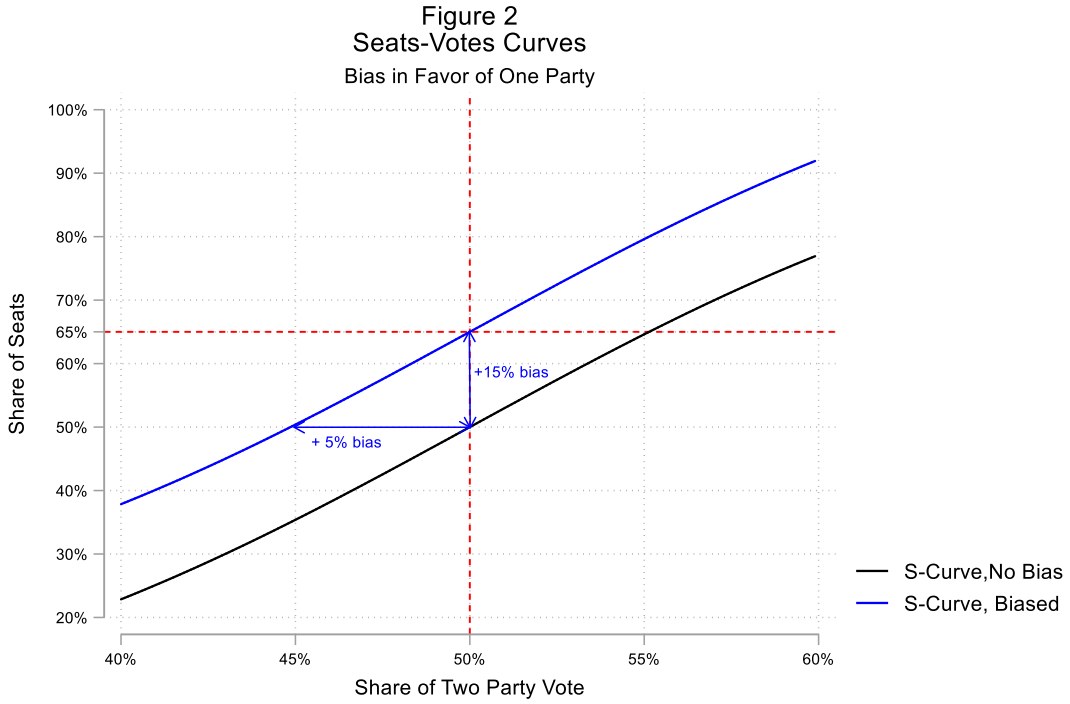
a. *Partisan Bias*

A gerrymandered district scheme is *biased* if it provides a one-sided benefit to a party (Tufte 1983; Grofman 1983; King and Browning 1987; McGhee 2014). In figure 1, all of the

[7] *Whitford v. Gill*, case 15-cv-421-bbc, United States District Court, Western District of Wisconsin.

curves pass through the (0.5,0.5) point, are symmetrical on both sides of 50% of the vote, and none allows a party to secure a majority of seats without obtaining a majority of the vote. In these senses, all are "fair" to both parties. But it is possible that an electoral system results in a general advantage for one side, allowing a party to win a greater share of seats than the other party at most plausible vote shares. Shifting the seats-votes to secure a partisan advantage is "the purpose of gerrymandering" (Tufte 1973, 548).

Figure 2 below shows two seats-votes curves, with the x-axis limited to show vote shares between 40% and 60%. The black line is an unbiased cube-law curve, which passes through the (0.5, 0.5) point, showing that at 50% of the aggregate vote each party wins 50% of the seats; it is the truncated version of the S-shaped curve in figure 1. The blue line shows a biased curve, reflecting an advantage that one party receives in how its votes are converted to seats. At every value of the vote share the party receives, it wins more seats than it wins under the unbiased seats-votes curve. Bias is usually calculated at 50% vote share, because it is the natural dividing point for majoritarian control, and it provides a single point of reference useful in comparing curves that are nonlinear over values on the x axis (Tufte 1973).



The two measures of bias – vertical and horizontal – capture different aspects of partisan gerrymandering (McDonald and Best 2015, 315) The vertical measure, captured by subtracting 0.5 from the fraction of seats won at 50% of the vote, is a measure of "seat-denominated bias," (or seat bias), capturing the additional seats a party wins at a hypothetical 50-50 vote. Here, 50% of the vote secures 65% of seats, indicating a positive bias in favor of one party of 15%.

The horizontal measure (indicated by the horizontal blue line) is a measure of "vote-denominated bias" (or vote bias) indicating that the favored party wins 50% of the seats with only 45% of the vote. This shows that the disfavored party would have to win 55% of the aggregate vote in order to win a majority of seats.

Calculating the vote-bias is straightforward: for any set of legislative districts *n*, the number of districts a party must win to obtain a majority, will be $i = (n+1)/2$ rounded up to the nearest integer.[8] If the districts are sorted in ascending order of the vote share of the minority party, the i^{th} district will be the pivotal district.[9] Subtracting the vote share in this district from 0.5, and adding the result to the aggregate vote share that party received, will show the statewide vote share the minority party would need to win in order to win a majority of seats, assuming a uniform swing.

At the state legislative and national congressional level, the party that wins just over 50% of the vote typically wins more than half of the seats, gaining a premium attributable to the nature of single member plurality systems (Tufte 1973). A small bias at 50% does not, by itself, indicate a gerrymander.

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[8] Rounding is necessary in the case of an even number of districts, because the median will be a fraction between the two central district numbers and must be rounded up. In a plan with 14 districts, 8 districts constitute a majority. The median of 14 is 7.5 (the average of the two central quantities, 7 and 8), which must be rounded up to 8.

[9] In Michigan, the pivotal district is the 8th rank-ordered district for a congressional plan, the 56th for the state House, and the 20th for the state Senate (the numbers refer to the rank, not an actual district number).

b. *Partisan Symmetry*

Bias is closely related to *symmetry*, a measure of whether parties are treated equally in their ability to translate votes into seats: if one party wins a particular share of seats at one vote share, the other party will, under partisan symmetry, win the same share of seats if it receives that share of the vote. In Figure 2, this is reflected in the fact that the blue curve is not symmetric around 50% of the vote. The advantaged party wins 65% of seats at 50% of the vote, and 50% of the vote with 44.9% of the vote. By definition, then, the disadvantaged party only wins 35% when *it* wins 50% of the vote, and must win 55.1% of the vote in order to win 50% of the seats.

The existence of partisan bias necessarily implies partisan asymmetry, in that no matter what share of the vote an advantaged party receives, it wins more seats than it would have under an unbiased seats-votes relationship. "Partisan bias," write King and Browning (1987, 1251-2), "introduces asymmetry into the seats-votes relationship, resulting in an unfair partisan differential in the ability to win legislative seats: the advantaged party will be able to receive a larger number of seats for a fixed number of votes than will be the disadvantaged party."[10]

Partisan symmetry is a measure of the underlying properties of a redistricting plan, and is a reliable indicator of gerrymandering. Empirically, it is an attractive metric as it captures a key feature of a fair democratic system – that parties (and, by extension, voters) be treated equally by an electoral scheme. Symmetry "is satisfied when a district plan *does not discriminate between the two parties* with respect to the conversion of votes to seats, and vice versa (Stephanopoulos and McGhee 2015, 843). It is a universally recognized indicator of fairness:

[10] *See also* King (1987,789): "[I]n a two-party system, the absence of bias is the situation where each political party is allocated the same proportion of seats for an equivalent proportion of votes."

> Social scientists have long recognized *partisan symmetry* as the appropriate way to define partisan fairness in the American system of plurality-based elections, and for many years such a view has been virtually a consensus position of the scholarly community. We are aware of no published disagreement or even clear misunderstanding of partisan symmetry as a standard for partisan fairness (Grofman and King 2007, 6).

Calculating partisan symmetry is straightforward: using the results from an election or a measure of baseline partisanship, calculate the aggregate vote share and the seat share for the party holding a majority of seats. Then conduct a uniform swing analysis, shifting the statewide vote by the amount needed to give the other party the equivalent vote share, and applying the shift in each district, determining the winner of each district election at the shifted vote percentage. If both parties have the same share of seats at the equivalent vote share, the electoral system is symmetric. If not, the difference in seat shares obtained at the same vote share is a measure of asymmetry (Niemi and Deegan 1978; Grofman and King 2007).

c. *Efficiency Gap*

The Efficiency Gap, proposed by McGhee (2014) and Stephanopoulos and McGhee (2015) directly measures "wasted votes":

> [A]ll elections in single member districts produce large numbers of wasted votes. Some voters cast their votes for losing candidates (and so are "cracked"). Other voters cast their ballots for winning candidates but in excess of what the candidates needed to prevail (and so are "packed"). A gerrymander is simply a district plan that results in one party wasting many more votes that its adversary. And the efficiency gap indicates the magnitude of the divergence between the parties' respective wasted votes. It aggregates all of a plan's cracking and packing choices into a single number.

(Stephanopoulos and McGhee 2015, 849-50).[11]

"Wasted" in this context means that a vote does not contribute to the election of a winning candidate. To return to a simple example, a candidate receiving 90 votes in a district with 100 voters is elected. But that candidate would also win with 51 votes. In the first instance, the additional 39 votes (calculated as 90 – 51) are "wasted" in that they are not necessary to her victory. Similarly, a candidate who receives 30 votes loses; those votes are wasted in that they play no role in determining the winner. The Efficiency Gap is calculated as the difference in the two parties' total wasted votes, divided by the total number of votes cast (Stephanopoulos and McGhee 2015, 851).

For each district, the wasted votes for each party ($W_{A,i}$ and $W_{B,i}$) are calculated as follows. In district *i,* let $V_{A,i}$ = votes cast for party A and $V_{B,i}$ = votes cast for party B.

$$W_{A,i} = V_{A,i} \quad if\ V_{A,i} < V_{B,i}\ ,$$
$$= \frac{V_{A,i} - V_{B,i}}{2} \quad if\ V_{A,i} > V_{B,i}$$

and

$$W_{B,i} = V_{B,i} \quad if\ V_{B,i} < V_{A,i}\ ,$$
$$= \frac{V_{B,i} - V_{A,i}}{2} \quad if\ V_{B,i} > V_{A,i}$$

Then the Efficiency Gap is calculated as the difference in the wasted votes of parties A and B, divided by the total votes cast, summed for all *n* districts.

$$EG = \frac{\sum_{i=1}^{n}(W_{A,i} - W_{B,i})}{\sum_{i=1}^{n}(V_{A,i} + V_{B,i})}$$

[11] McGhee initially referred to this quantity as "relative wasted votes" (2014, 68).

In this expression, a positive EG means that party A wastes more votes than party B, and a negative EG means that B is wasting more votes than A.[12] Because the net wasted votes are divided by the total votes cast, the EG is expressed in percentage terms for state legislative plans. Stephanopoulos and McGhee express the EG for U.S. House elections in terms of seats, calculated as the efficiency gap multiplied by the number of seats in a congressional delegation (2015, 854).[13]

d. *Mean-Median Vote*

McDonald and Best (2015) argue that a proper measure of partisan gerrymanders should be focused on how votes are treated differentially, not the specific mapping function that translates vote shares into seat shares. The unfairness of gerrymandering stems from the fact that voters are harmed when the weight of each vote is enhanced or diminished by the way that voters are aggregated into districts (McDonald and Best 2015, 315). The metric of a gerrymander, in their view, is not whether a party wins the share of seats that it deserves, but the simpler measure of whether voters are weighted equally.[14]

They propose a mean-median test that compares a party's mean district vote to its median district vote. A party's median district vote percentage is a crucial pivot point, because it is the precise midpoint at which half the seats lie above that percentage, and half below. By definition, the median vote for the party holding a majority of seats must be greater than 50% (since the party must have at least this share of the vote in half of the districts), while the minority party median vote must be below 50%. A median greater than the mean

[12] The Efficiency Gap can also be calculated using aggregate seat and vote shares, using the simplified formula:

$$EG = (Seat\ Margin - 0.5) - (2\ x\ Vote\ Margin)$$

This converges on the individual seat calculation as turnout across districts becomes equal.

[13] In a state with 15 congressional seats, for example, an Efficiency Gap of -10% would translate into -0.1 x 15 =-1.5 seats.

[14] Best et al. (2018) also argue that because the mean-median test imposes no assumptions about how many seats a party *should* have won compared to a neutral baseline, it is the most direct metric of unequal voting power.

indicates a degree of asymmetry in district lines (arising through packing and cracking): "Where the median is shown to be persistently higher or lower than the mean, a district plan is stacked against one set of partisans" (McDonald and Best 2015, 329). When partisans are packed and cracked – the essence of a partisan gerrymander – the mean vote for the minority party will always be larger than the mean.

Wang (2016) uses the 2012 U.S. house elections in Pennsylvania to demonstrate the phenomenon. Of the state's 18 congressional districts, the Democratic vote share in each, when sorted from smallest to largest (seats won Republicans are Red, Democrats blue) are as follows:

Table 4

	District Rank Order	Democratic Share of Two-Party Vote %
Least Democratic	1	34.4%
	2	36.0%
	3	37.1%
	4	38.3%
	5	40.3%
	6	40.6%
	7	41.5%
	8	42.9%
	9	43.2%
	10	43.4%
	11	45.2%
	12	45.2%
	13	48.3%
	14	60.3%
	15	69.1%
	16	76.9%
	17	84.9%
Most Democratic	18	90.6%

Democrats won just 5 of the 18 seats (28%), even though they received a majority of the statewide vote: the mean of these 18 district vote shares is 51.0%.[15] The median Democratic vote share is 43.3%.[16] The difference – the mean minus the median – is approximately -7.7 percentage points, and indicates asymmetry.

The mean-median difference is also apparent from examining the distribution of vote percentages (Wang 2016, 1300-01).[17] In Pennsylvania, there were 9 seats where the Republican received between 50 and 60 percent of the vote, compared to zero Democratic candidates with those percentages. Four Democrats received more than 65% of the vote, compared to zero Republicans. Taken together, this is an indicator of packing (concentrating Democratic voters in districts where they constitute large majorities) and cracking (spreading other Democratic voters into districts where they constitute minorities).

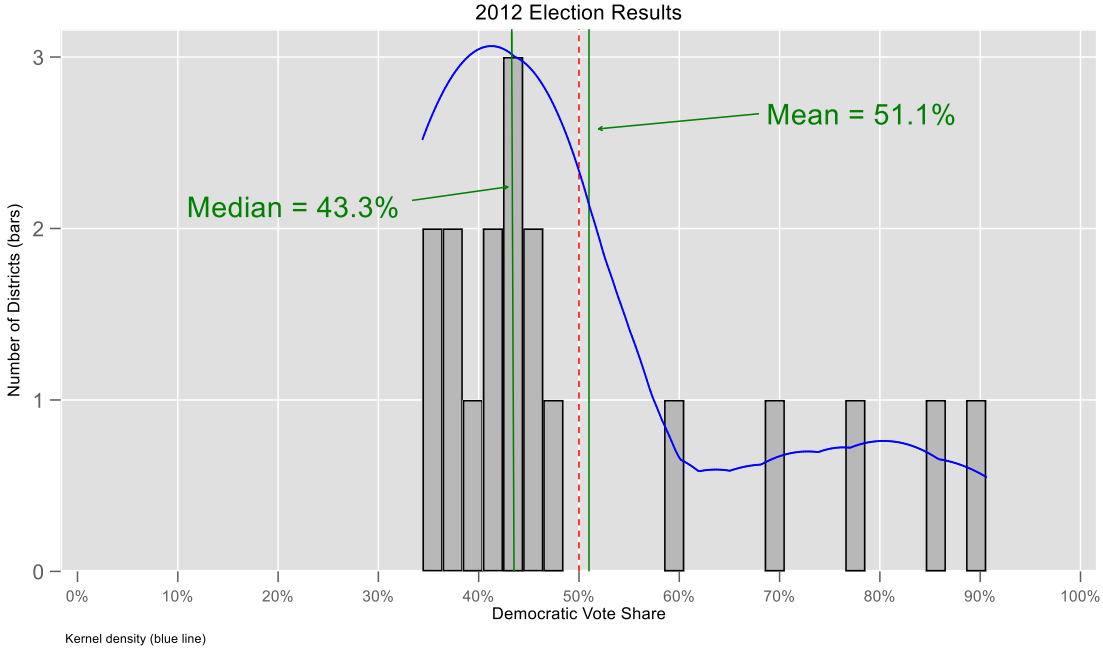
A histogram shows this visually:

[15] The mean-median test weights all districts equally, and does not take differences in turnout into account across districts. The actual statewide 2-party vote split in 2012 House elections was 50.8% -49.2% Democratic.

[16] In a data set with an even number of observations, the median is the mean of the two central values (here, the mean of the 9th and 10th rank-ordered values, 43.2% and 43.4%, or 43.3%).

[17] Gelman and King Stem (1990, 276-77) use stem-and-leaf plots (in effect, histograms and kernel density plots).

Figure 3
Distribution of Pennsylvania U.S. House Districts



The skewness – itself a function of packing and cracking –is obvious (note that in this graph, all bars left of the red line at 50% Democratic vote are Republican wins, while the five bars to the right are Democratic wins). Republican-majority districts are concentrated in the 35-50% range (and even more heavily in the 40-49% range), while Democratic-majority districts are all above 60%.[18] The average Democratic winning percentage (the mean for all districts where the Democratic candidate received > 50% of the vote) is 76.4%, while the average Republican winning vote percentage is 58.7%.[19]

Advocates of the mean-median measure argue that it more accurately classifies both gerrymanders and non-gerrymanders (Best et al., 2018).[20]

[18] In this graph, the blue line is a kernel density, which is a continuous approximation of a discrete histogram.
[19] The efficiency gap in this plan is -23.7 using the individual district data, and -26.2 using the aggregate seat/vote formula, converting into -4.3 and -4.7 House seats, respectively.
[20] The mean-median test does not pick up all examples of gerrymandering. Consider the extreme case where one party draws lines such that it wins 53% of the vote in every district, giving it 100% of the seats with 53% of the statewide vote. Such an imbalance is obviously egregious, but in this case the mean and median votes are the same (53%), indicating no skewness or gerrymandering. The Efficiency Gap, in contrast, would detect it. Three percent of the vote for the winners is wasted

e. *Declination*

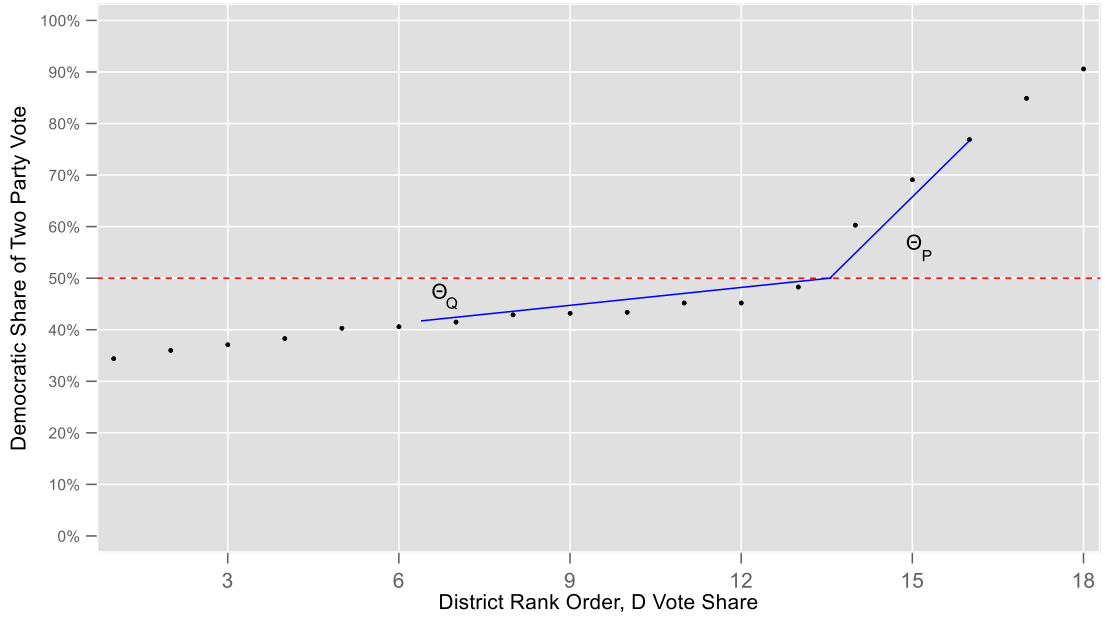
Warrington (2018) offers an alternative formula for identifying asymmetry, using the shift in the spatial distribution of vote percentages for the parties on either side of 50% of the vote (which is the cut point where seats change from one party to the other). In a randomly generated (or completely neutral) district plan, there is nothing special about the 50% point and no reason to expect any patterns immediately above or below it. In contrast, "[p]artisan gerrymandering, almost by definition, modifies a natural distribution in a manner that treats the 0.5 threshold as special. Accordingly, one approach to recognizing gerrymanders is to contrast the set of values below 0.5 with the set of values above 0.5" (Warrington 2018, 41).[21]

To see this, consider another visual depiction of the 2012 Pennsylvania US House elections. The *declination* is the difference in the slope of the line connecting districts below 50% to those above 50%. The lines are drawn from the median point in the rank order of each set of districts (those above and those below 50%) to the point midway between the two districts immediately below and immediately above 50%. If the two lines depart from the single line drawn between the central moment of each half of the graph, it is evidence of packing and cracking (Warrington 2018; *see also* Nagle 2015).

(the surplus over 50%), while all 47% of the votes for the losers are wasted. Using the formula EG= (seat share – 0.5) – (2 x vote margin), the Efficiency Gap in this instance is 44%.

[21] In a packing and cracking gerrymander, for example, one party's vote share above 50% will be concentrated at a few high values (packing), and at values close to but below 50% (cracking).

Figure 4
Declination Example
2012 Pennsylvania US House Elections



Here, θ_Q is the angle between the horizonal line at vote share 50% and the blue line connecting the point at which seats flip from one party to the other and the "center mass" of the vote shares of Democratic seats.[22] θ_P is the equivalent angle for seats won by Republicans. Here, θ_P is obviously much larger than θ_Q. The difference in the slopes of the two blue lines (and the angles between the lines and the horizontal line at 50% Democratic vote share) is the declination, calculated as follows (Warrington 2018, 41): Set z_i = vote share of Democratic candidate in district i; k = number of districts with a Republican winner, and k' = number of districts with a Democratic winner, and N=total number of seats. Then,

$$\bar{z} = \text{average Demcratic vote \% in districts won by Democrats (all } z > 0.5)$$

$$\bar{y} = \text{average Democratic vote \% in districts won by Republicans (all } z < 0.5)$$

$$\theta_P = \arctan\left(\frac{2\bar{z} - 1}{k'/N}\right)$$

[22] Formally, the center mass of the distribution of seats is the point (median seat, mean vote share) for each set of districts the parties win.

$$\theta_Q = \arctan\left(\frac{1-2\bar{y}}{k/N}\right)$$

And the declination is

$$\delta = 2(\theta_P - \theta_Q)/\pi,$$

which takes values in (-1, 1) and is expressed as a fraction of 90 degrees (Warrington 2018, 41). Here, positive values indicate a bias in favor of Q (the Republicans in the graph), while negative values indicate a bias in favor of P. Warrington calculates $\delta = 0.53$ for 2012 PA US House elections, which is equivalent to 4.75 seats in pro-Republican bias (2018, 44).[23]

f. *Summary*

The concepts of partisan bias and partisan symmetry are useful in assessing the underlying qualities of a district plan, while the three explicit quantities – the efficiency gap, the mean-median, and declination – provide a way to generate concrete measures that allow direct methods of comparing district plans, calculating the specific degree of partisan gerrymandering that exist in a plan. The neutral/random process can indicate whether any gerrymanders are intentional or the result of natural geographic factors such as sorting or urbanization.

While there may be differences in opinion about which quantity (or variant, or combination of measures) is the best indicator of gerrymandering, and analysts preferring one over the others in specific instances (see McGhee 2018), they all capture the same underlying phenomenon: the partisan imbalance in how votes are converted into seats. Stephanopoulos and McGhee (2018) conclude that the "metrics are all linked mathematically to each other (2017, 5), can be exactly equivalent under some conditions, or are easily transformed from one form to another. The result is that in many circumstances – and especially when statewide vote splits are competitive, "all of the

[23] This is very close to the Efficiency Gap calculation of -4.7 using the aggregate seat share and vote share formula.

measures produce similar results," in large part because they all are different ways of assessing partisan symmetry (2017, 6).[24]

Any controversy over which measure is preferable to another is relevant only when the metrics themselves diverge; that is when some measures indicate a partisan gerrymander while others do not. Cain et al. (2018) argue that an automated map drawing process that incorporates multiple standards of partisan fairness (minimizing bias, responsiveness, competitiveness, and the efficiency gap) is better than relying on a single standard to judge an actual map.

D. Evaluation of Michigan Districting Plans

I use these metrics to analyze the legislatively-drawn district plans for the State House, State Senate, and U.S. House after the 2010 Census. In conducting this analysis, I relied on data stipulated by the parties. The data file provided to me has one observation for each of Michigan's 329,885 Census blocks, and includes population, VTD assignments, district assignments to State House, State Senate, and U.S. House districts, and data allocating to each block Democratic and Republican votes in a series of statewide elections. The election data I used was aggregated from the stipulated data into baseline measures by Professor Jowei Chen.

This baseline data set constitutes an exogenous estimate of the underlying partisanship of each type of district independent of district geographies, incumbency, or the district-level campaign variation. It permits the accurate estimation of the partisanship of alternative district plans.

The data generates two estimates: one using statewide election data between 2006 and 2010, and one using statewide data between 2012 and 2016. The 2006-2010 data was

[24] Note that *efficiency* is directly related to symmetry: if one party can more efficiently translate votes into seats, the *other party* is treated asymmetrically, as the same percentage of the vote produces fewer seats for the disadvantaged party.

available to map drawers before they drew district lines in 2011-2012, and provides a prospective estimate of what would happen in the new districts. The 2012-2016 data indicates what actually did happen in the new districts.

To generate district level data, I collapsed the data to each district geography for the different plans (U.S. House, State House, and State Senate), and then applied the methods described above to calculate different measures of partisan gerrymandering. With the exception of the declination measure, negative values of the metrics in the tables indicate a pro-Republican bias.

1. U.S. House of Representatives Districts

Michigan has fourteen seats in the U.S. House of Representatives. Democratic candidates received 52.7% of the actual two-party vote statewide in 2012, 50.9% of the statewide vote in 2014, and 49.4% in 2016, and won five seats in each cycle.[25] This is consistent with the baseline estimates of 53.0% using 2006-2010 data, and 52.2% using 2012-2016 data, with five Democratic wins in each. There were no uncontested districts in 2012, 2014, or 2016.

Table A1 in Appendix 1 shows the district-level Democratic vote shares for each congressional district.

The metrics calculated using the baseline data are as follows:

[25] Election data obtained from Michigan Secretary of State website, http://miboecfr.nictusa.com/election/results/12GEN/#06001000. In July 2012, the 11th Congressional District Representative, Thad McCotter, resigned his seat. To fill the remainder of the term, a special election was held on the same day as the regular general election, November 6, 2012, to occupy the seat between November 13, 2012 and the beginning of the 113th Congress (which began January 3, 2013). I do not count the special election results in the actual 2012 figures, although including them would not materially change the inferences.

Table 5
Michigan US House of Representatives
Statewide Election Baseline

	2006-2010	2012-2016
Democratic Share of Statewide Vote	53.2%	52.3%
Seats Won By Democrats	5	5
Democratic Share of Seats	35.7%	35.7%
Partisan Bias, actual	-17.5%	-16.6%
Partisan Bias @50%	-14.3%	-14.3%
Republican Seats won at Democratic Vote Share	10	9
Republican Share of Seats at Democratic Vote Share	71.4%	64.3%
Democratic Vote Share Needed to Win Majority of Seats	57.2%	57.5%
Efficiency Gap	-20.9%	-19.7%
Mean-Median	-6.8%	-7.7%
Average Democratic Win %	69.1%	69.7%
Average Republican Win %	55.4%	56.9%
Declination	0.415	0.398

a. Partisan Bias and Asymmetry

The bias and asymmetry of this plan are apparent: Democrats won just over one third of seats (5 of 14) even though they won a majority of the statewide vote. This counter-majoritarian result is itself evidence of a partisan advantage, and is consistent with the partisan bias and asymmetry of the plan.

With 53.1 % of the vote and 35.7% of seats using 2006-2010 data, the observed partisan bias of this plan is -17.5%; using the 2012-2016 data, the observed bias is -16.6%. When adjusted to 50% of the statewide vote using a uniform swing, the bias becomes -14.3% using both sets of data.[26] In practical terms, this means that Republicans would win an estimated 64.3% of seats at a tied 50%-50% vote.

The Democratic vote and seat share can be used to evaluate symmetry, by shifting the vote in each district to estimate what would happen if the Republican party won the same percentage of the aggregate vote as the Democrats. This requires a uniform shift from the Republican share of the vote – 46.9% for 2006-2010 and 47.7% for 2012-2016 – to the Democratic percentage (53.1 % and 52.3%). The resulting district-level vote estimates show that Republicans would win an additional seat using 2006-2010 data – precisely double the number of seats that Democratic candidates won, and 9 seats at the Democratic percentage using 2012-2016 data.

The Democratic vote share in the pivotal 8th rank-ordered district (the district that would give Democrats a 8-6 seat majority) is 47.0% using 2006-2010 data and 45.1% using 2012-2016 data. Subtracting these quantities from 0.5 and adding to the aggregate statewide share of the votes Democrats received produces an estimate of the statewide vote that would be needed for Democrats to win a majority of U.S. House seats: 57.2% and 57.5% of the aggregate vote.

b. Efficiency Gap

I calculated the Efficiency Gap metric using the "full method," calculating district-level measures of wasted votes. The EG scores for the congressional plan is extraordinarily large

[26] The bias estimated at 50% is smaller than the bias at the observed vote share, because the number of seats won by the two parties does not change as the vote is shifted from the observed value of 53.2% Democratic (or 46.8% Republican) to 50%-50%. There are no Democratic seats in the 50-53.2% range, so no seats flip from one party to the other as the Democratic vote share drops by 3.2% in each district – the uniform shift that simulates a tied statewide vote Consequently, the imbalance between vote share and seat share (the definition of bias) decreases slightly.

and negative: -20.9% using the 2006-2010 data, and -19.7% using the 2012-2016 data. This demonstrates that the bias in the plan is enduring, as it remains stable over the prospective and actual results.

When converted into seats, this represents 2.8 – 2.9 additional seats for Republicans. It is also consistent with Stephanopoulos and McGhee's calculations of Michigan's 2012 EG, using actual election results (2015, 879).[27]

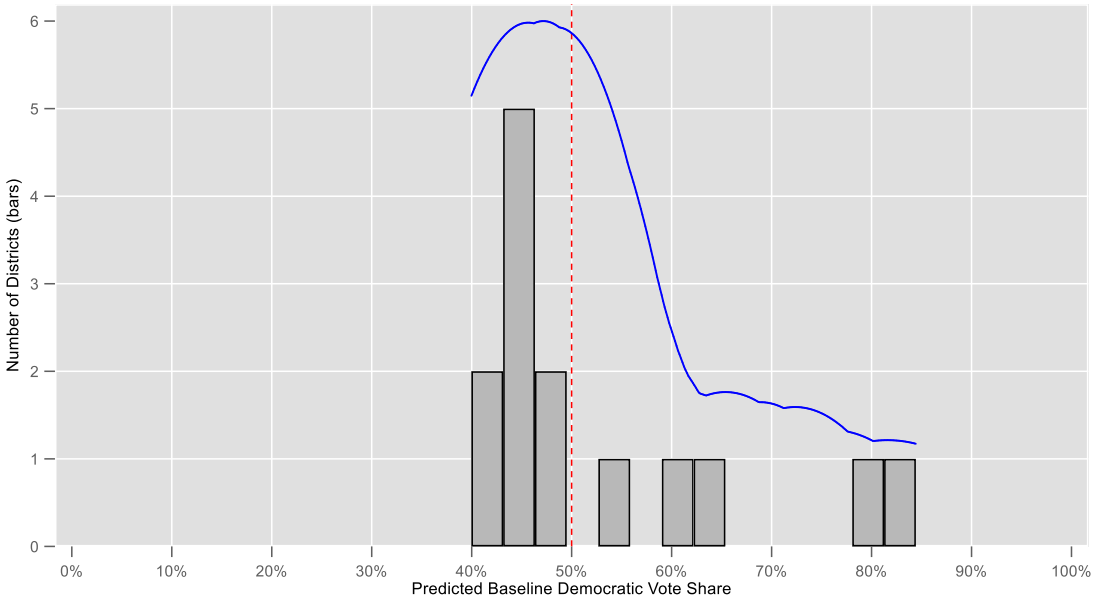
c. Mean-Median

The mean-median test (Best et al. 2018; McDonald and Best 2015), similarly show the existence of a pro-Republican bias. The mean Democratic vote share, weighting each district equally, is 53.3% (2006-2010) and 52.6% (2012-2016), measures comparable to the Democratic share of the statewide vote in both cases. The median Democratic vote shares are 46.5% and 45.0%, respectively, producing mean-median measures of -6.8% and -7.7%.

A mean-median difference of this size indicates both packing and cracking, and when combined with the counter-majoritarian nature of the result (a majority of the vote producing a minority of seats) is evidence of unequal weighting of Democratic and Republican votes. A histogram and density plot of baseline partisanship demonstrates this visually. In both sets of data (whether 2006-2010 or 2012-2016 data), Republican districts have vote shares concentrated in the 40-49% range of predicted Democratic vote (cracking), while Democratic districts are in the 60-90% range of predicted Democratic vote (packing).

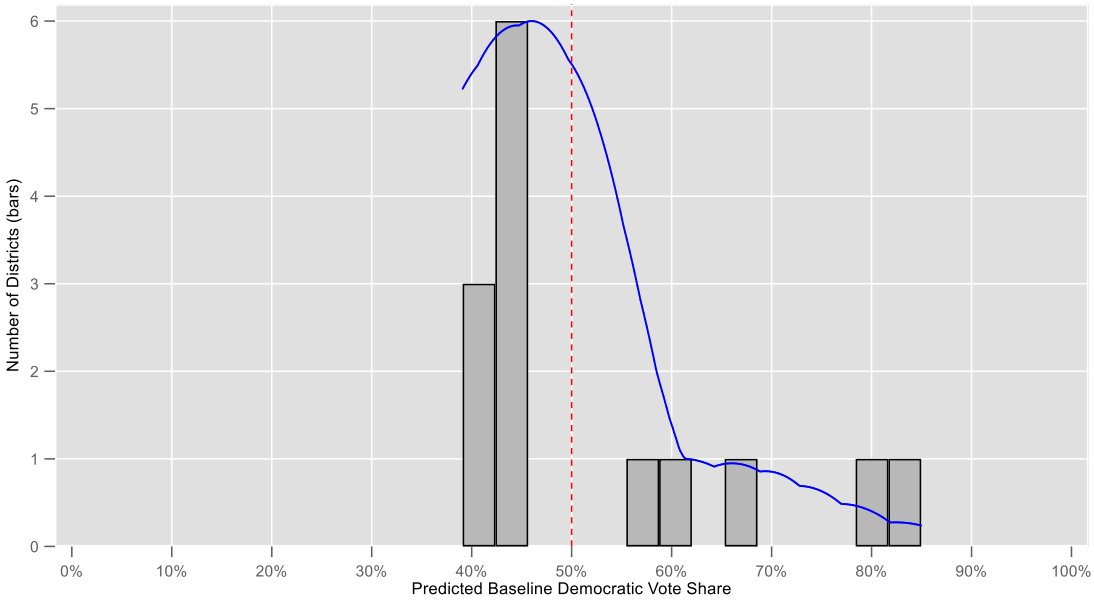
[27] This similarity indicates that the EG is robust to different underlying estimates of partisanship and voting behavior.

Figure 5
Distribution of Michigan U.S. House Districts
Predicted Baseline Vote using 2006-2010 Data



Kernel density (blue line) weighted by total district vote

Figure 6
Distribution of Michigan U.S. House Districts
Predicted Baseline Vote Using 2012-2016 Data



Kernel density (blue line) weighted by total district vote

The blue lines in the graphs represent the kernel densities of the distribution of district votes. They clearly demonstrate the degree to which Republican vote shares are clustered

marginally below the crucial 50% Democratic vote threshold, and the asymmetry of the distribution. The large tail toward the right side of the graph, and the lack of any similar densities on the left side of the graph, indicate the different ways that Democratic and Republican votes are aggregated.

The asymmetry is also revealed by examining the mean winning percentage of Democratic and Republican votes. For districts won by Democrats (where the Democratic vote > 50%), the average is 68.8%% (2006-2010) and 69.6% (2012-2016). The equivalent quantity for districts won by Republicans is 55.5% (2006-20100 and 56.8% (2012-2016).

d. Declination

Finally, the declination – the change in slope in the vote shares on either side of 50% of the vote – also strongly indicates a pro-Republican bias. A visual inspection of the sorted Democratic vote percentage reveals the concentration of Republican districts (1-9) in the 40-50% Democratic vote range (evidence of cracking) and the concentration of Democratic districts (10-14) in the mostly uncompetitive range above 60% (evidence of packing). The blue lines show the lines used to calculate the declination, and the change in the slopes are apparent.

The declination metric is 0.415 using 2006-2010 data and 0.398 using 2012-2016, similar to Warrington's calculation using actual and imputed results of 0.43 in 2012 and 0.38 in 2014 (2018, 45).

Figure 7
US House Declination
Predicted Baseline Vote Using 2006-2010 Data

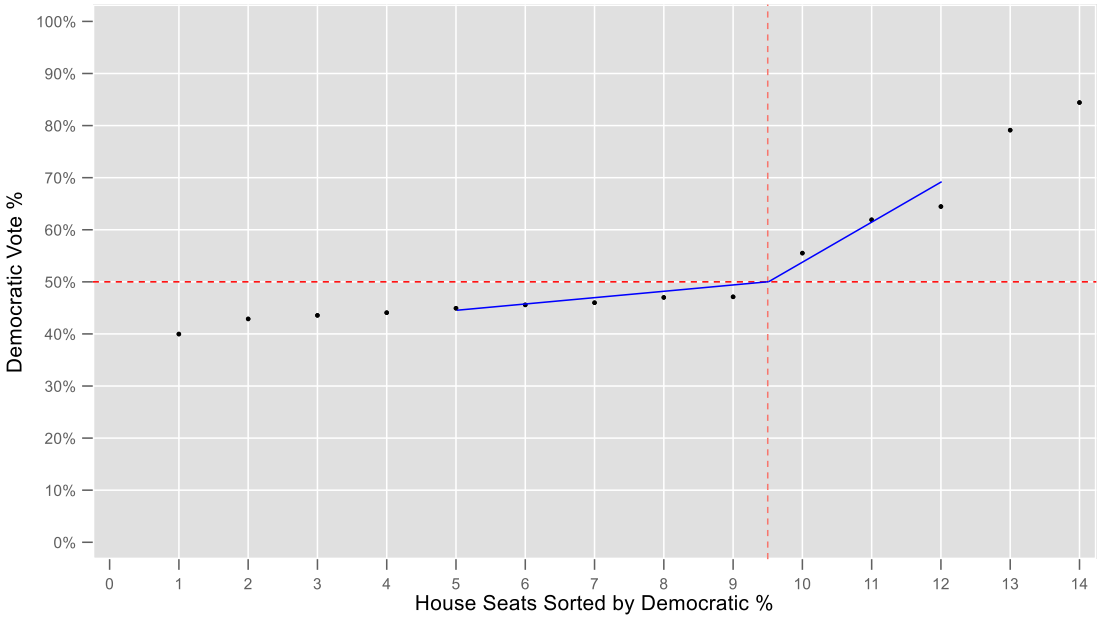
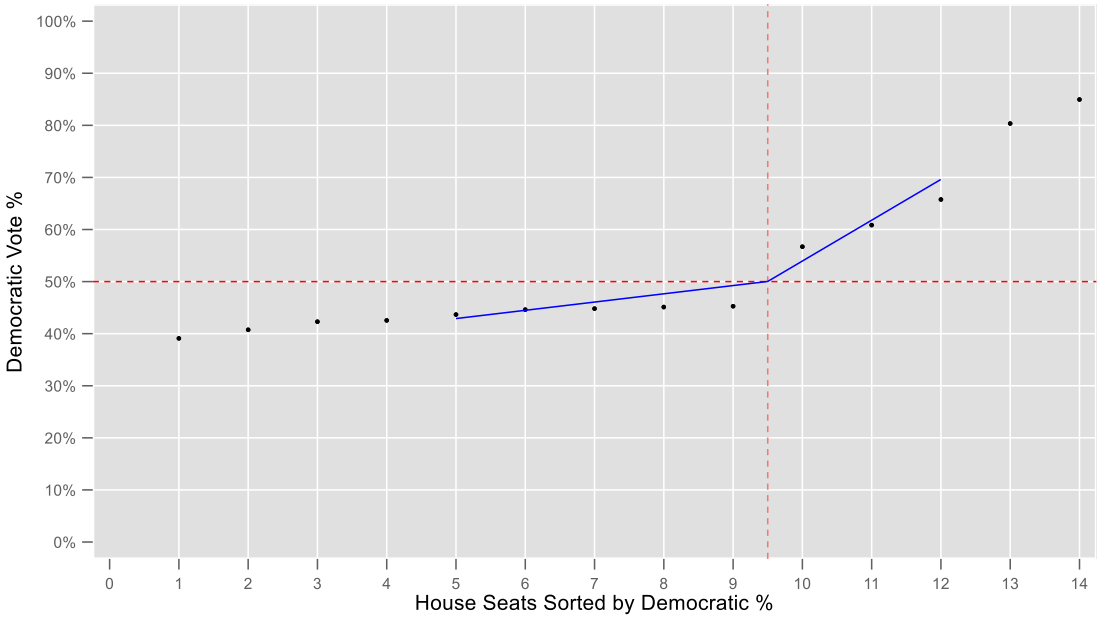


Figure 8
US House Declination
Predicted Baseline Vote Using 2012-2016 Data



e. Effect of Majority-Minority Districts

The Michigan congressional district plan created two majority-minority districts, the 13th (55.7% African American VAP) and 14th (57% African American VAP) CDs, from table A1. These are by a significant margin the most Democratic districts in the state, with a predicted 2006-2010 baseline of 84.8% and 80.2% Democratic vote.

The concentration of Democratic voters in these districts does not explain the extent of the indices of gerrymandering. When the analysis is replicated excluding the 13th and 14th congressional districts – and thus considers only the rest of the state – the results still show extreme values on all metrics:

Table 6
Michigan US House of Representatives
Statewide Election Baseline
Excluding Majority-Minority Districts (2)

	2006-2010	2012-2016
Number of Districts	12	12
Democratic Share of Statewide Vote	48.5%	47.6%
Seats Won By Democrats	3	3
Democratic Share of Seats	25.0%	25.0%
Partisan Bias, actual	-23.4%	-22.6%
Partisan Bias at 50%	-25.0%	-25.0%
Republican Seats won at Democratic Vote Share	8	8
Republican Share of Seats at Democratic Vote Share	66.7%	66.7%
Democratic Vote Share Needed to Win Majority of Seats	52.9%	53.0%
Efficiency Gap	-22.2%	-20.5%

Mean-Median	2.8%	2.9%
Average Democratic Win %	60.6%	61.1%
Average Republican Win %	55.4%	56.9%
Declination	0.357	0.347

This partisan bias, asymmetry, and efficiency gap metrics are all *worse* than the numbers for the entire plan, because while the Democratic vote share declines by roughly 5 percentage points, their seat share drops by much more, from 5 of 14 seats (35.7% seat share) to 3 of 12 (25% seat share). The asymmetry remains: while Democrats won 3 seats with roughly 48% of the vote, Republicans would win 8 seats at the equivalent vote share.

The mean-median and average Democratic winning vote percentage decrease, as would be expected after excluding the two strongest Democratic districts, but the disparities remain: the mean-median remains positive.

Democrats would still have to win more than a majority of the vote in order to win a majority of seats (about 53% of the vote).

Visually, the packing and cracking remains evident: all Republican districts remain in the 40-50% Democratic vote range and are highly concentrated at 45-50%, while the 3 Democratic districts are congregated at or above 60% of the vote. There are two districts in which Democrats receive > 60% of the vote, while no districts have a Republican receiving > 60%.

Figure 9
Distribution of Michigan U.S. House Districts
Excluding Majority-Minority Districts

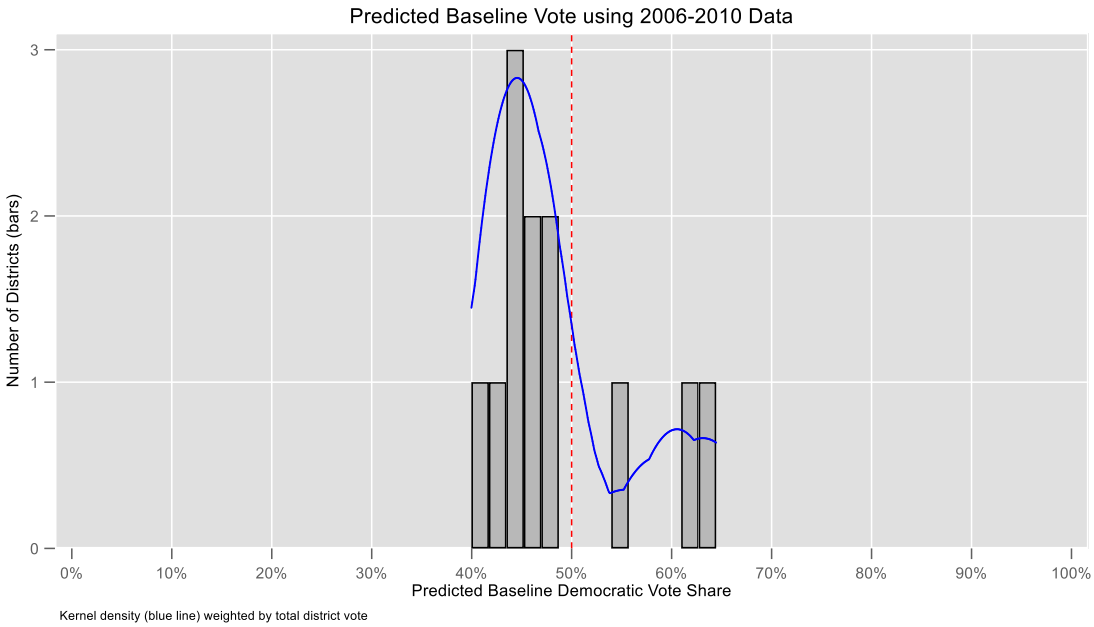
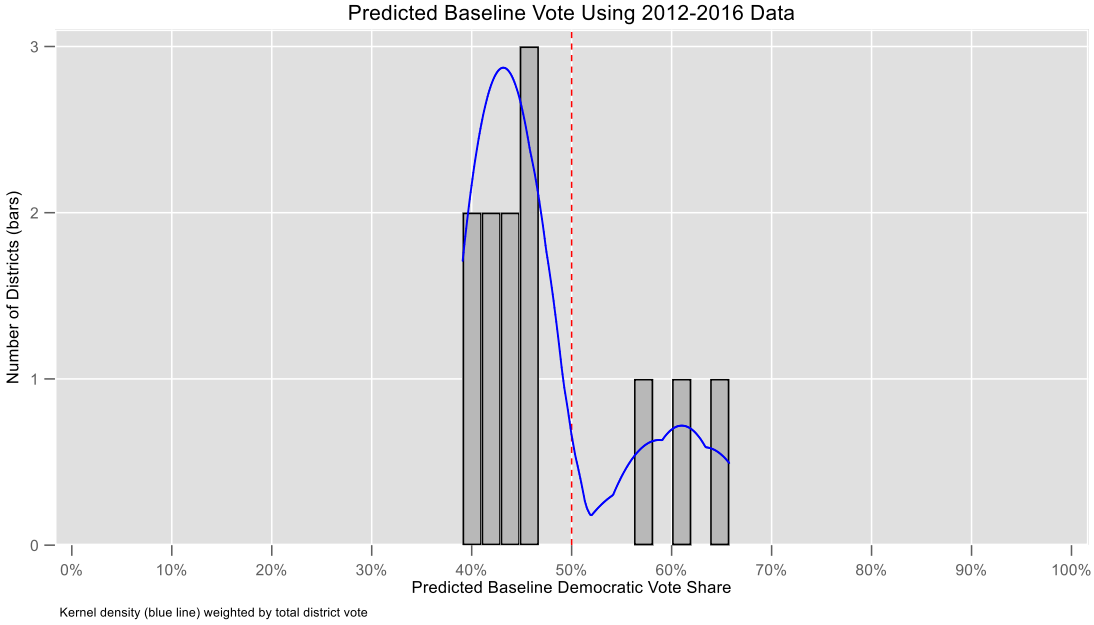


Figure 10
Distribution of Michigan U.S. House Districts
Excluding Majority-Minority Districts



The declination shrinks somewhat after removing the VRA districts (to 0.357 and 0.347), but remains positive. The difference in slope is still apparent:

Figure 11
US House Declination
Excluding Majority-Minority Districts
Predicted Baseline Vote Using 2006-2010 Data

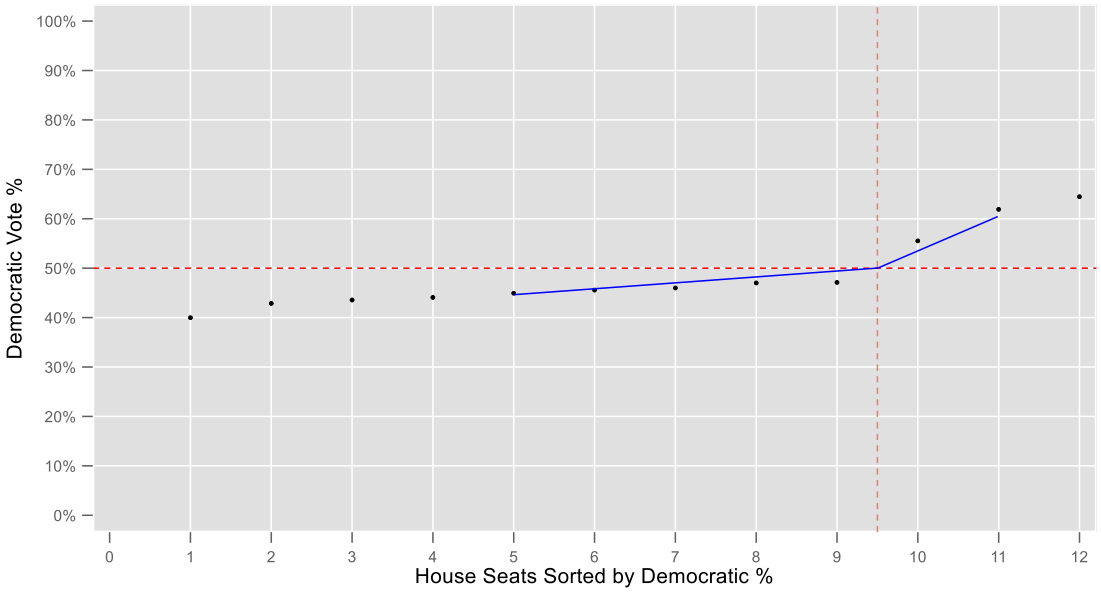
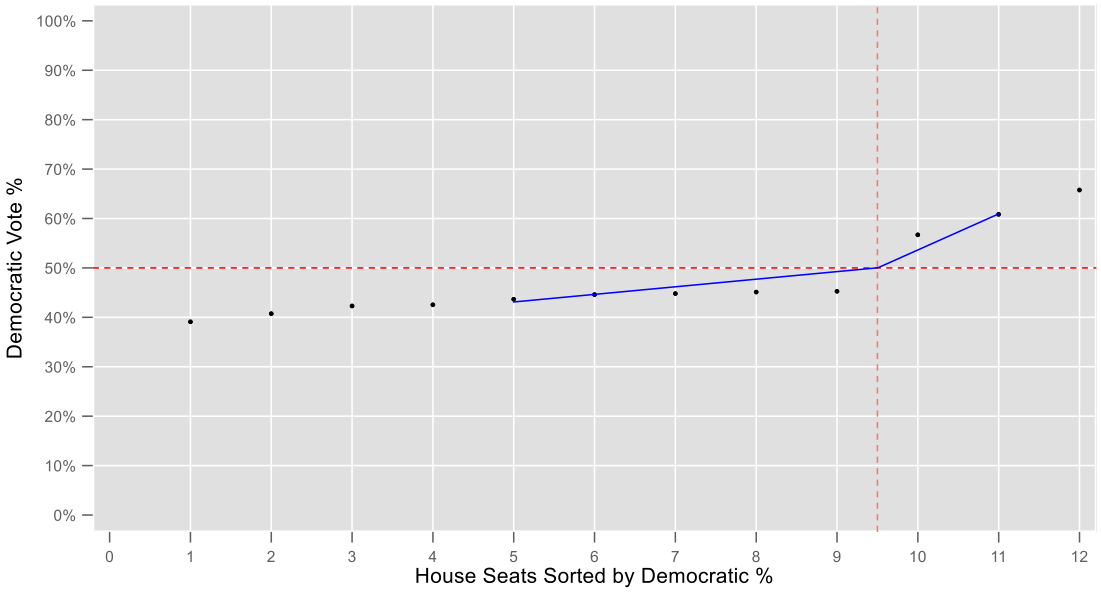


Figure 12
US House Declination
Excluding Majority-Minority Districts
Predicted Baseline Vote Using 2012-2016 Data



2. Michigan State House of Representatives

The Michigan House of Representatives has 110 districts. Democratic candidates received actual aggregate statewide vote shares of 53.9% in 2012, 50.9% in 2014, and 49.97% in 2016. Democrats won 51 seats in 2012, and 47 in both 2014 and 2016. There were two uncontested districts in 2012 (the 88th and 90th), with Republican candidates running unopposed in both. There were no uncontested districts in 2014 or 2016.

Table A2 in Appendix 1 shows the baseline district-level Democratic vote shares in each state House district.

The metrics are as follows:

Table 7
Michigan State Lower House
Statewide Election Baseline

	2006-2010	2012-2016
Democratic Share of Statewide Vote	53.2%	52.3%
Seats Won By Democrats	49	49
Democratic Share of Seats	44.5%	44.5%
Partisan Bias, actual	-8.6%	-7.8%
Partisan Bias at 50%	-10.9%	-9.1%
Republican Seats won at Democratic Vote Share	72	70
Republican Share of Seats at Democratic Vote Share	65.5%	63.6%
Democratic Vote Share Needed to Win Majority of Seats	54.8%	56.2%
Efficiency Gap	-13.8%	-12.0%
Mean-Median	-5.3%	-6.9%
Average Democratic Win %	68.2%	69.0%

Average Republican Win %	59.4%	59.4%
Declination	0.266	0.243

a. Partisan Bias and Asymmetry

As was the case with the U.S. House plan, the bias and asymmetry of the State House plan is apparent. The Democratic statewide vote shares do not change (as they are all a function of statewide election data and are independent of any district configuration). Democrats continue to garner majorities of the statewide vote, but win just 44.5% of seats (49 seats) using both sets of data. Again, this is a counter-majoritarian result.

53.2% of the vote and 44.5% of the seats using 2006-2010 data produces an observed partisan bias of -8.6%; the equivalent bias for 2012-2016 is -9.1%. When adjusted to 50% of the statewide vote using a uniform swing, the bias increases to -10.9% (2006-2010) and -9.1% (2012-2016). At 50% of the vote, Republicans win between 59.1% (2012-2016) and 60.9% (2006-2010) of seats.

Repeating the uniform swing analysis used in the U.S. House section, the baseline data show that if Republicans received the same percentage of the aggregate vote as Democrats, they win far more seats: between 70 and 72, compared to the 49 seats Democrats won at the same vote share.

Democrats would need 54.2% of the aggregate vote (2006-2012) and 55.5% of the vote (2012-2016) to win a majority of seats (56).

b. Efficiency Gap

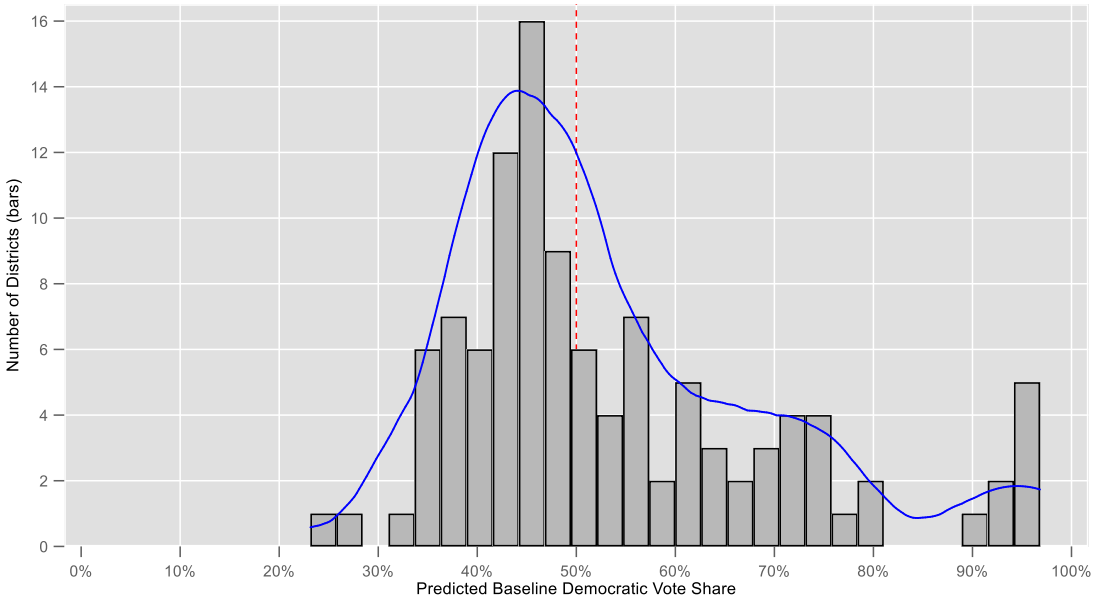
The full-method efficiency gap calculations for the lower House are -13.6% (2006-2010) and -11.9% (2012-2016). The values show that the partisan bias of the plan is enduring over multiple election cycles.

c. Mean-Median

The mean-median calculations are comparable to those of the U.S. House plan: -5.3% (2006-2010) and -6.9% (2012-2016). When combined with the counter-majoritarian property of the district plan, this indicates an unequal voting weight assigned to Democratic and Republican voters.

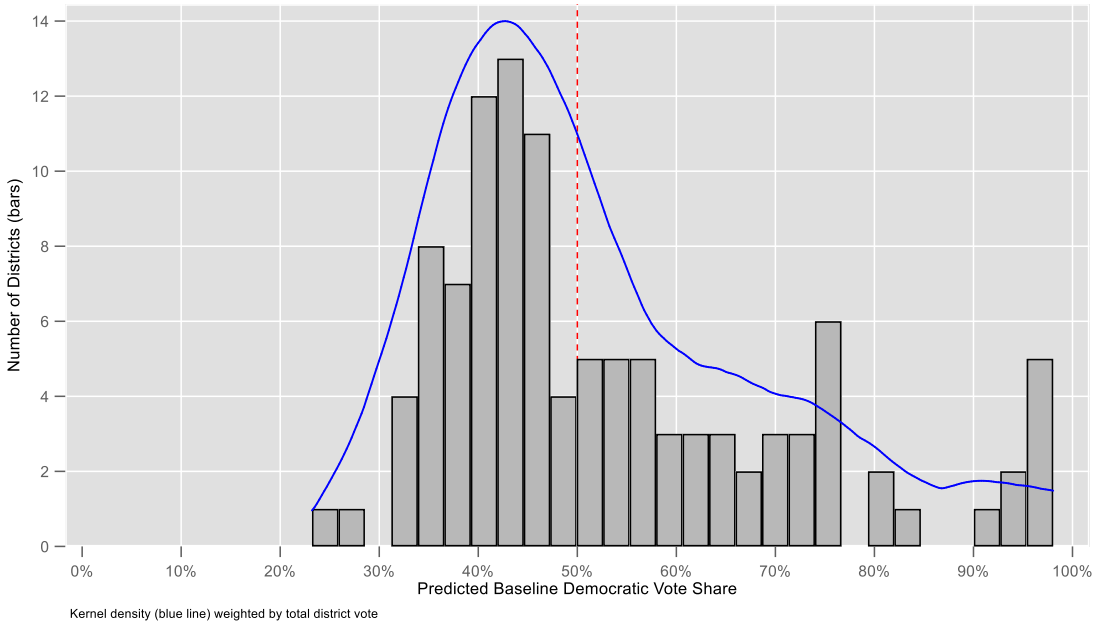
Histograms of district vote shares underscore the degree of packing and cracking that produces this mean-median difference.

Figure 13
Distribution of Michigan Lower House Districts
2006-2010 Baseline



Kernel density (blue line) weighted by total district vote

Figure 14
Distribution of Michigan Lower House Districts
2012-2016 Baseline



The graphs show that Republican districts are again concentrated in the 35-50% range of the Democratic vote, with only two districts below 30% Democratic vote (indicating a safe Republican district of >70% Republican vote). In contrast, Democratic districts tend to be much less competitive, with 21 (2006-2010) and 19 (2012-2016) districts in which the Democratic strength >70%. The kernel density shows the asymmetry, with the mode at about 42% Democratic (indicating cracking of the Democratic vote) and a very large right-side tail (indicating packing of the Democratic vote).

d. Declination

The declination values for both 2006-2010 (0.266) and 2012-2016 (0.243) are positive, though somewhat smaller than the analogous values for the US House plan. But the difference in the slope of the lines on either side of 50% remains apparent:

Figure 15
MI Lower House Declination
2006-2010 Data

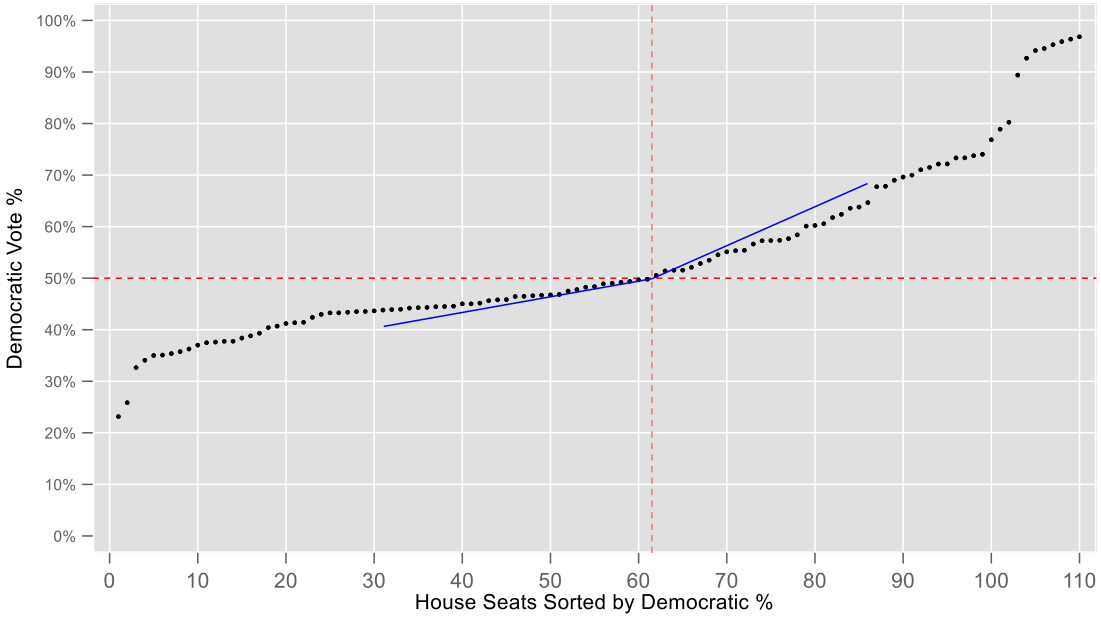
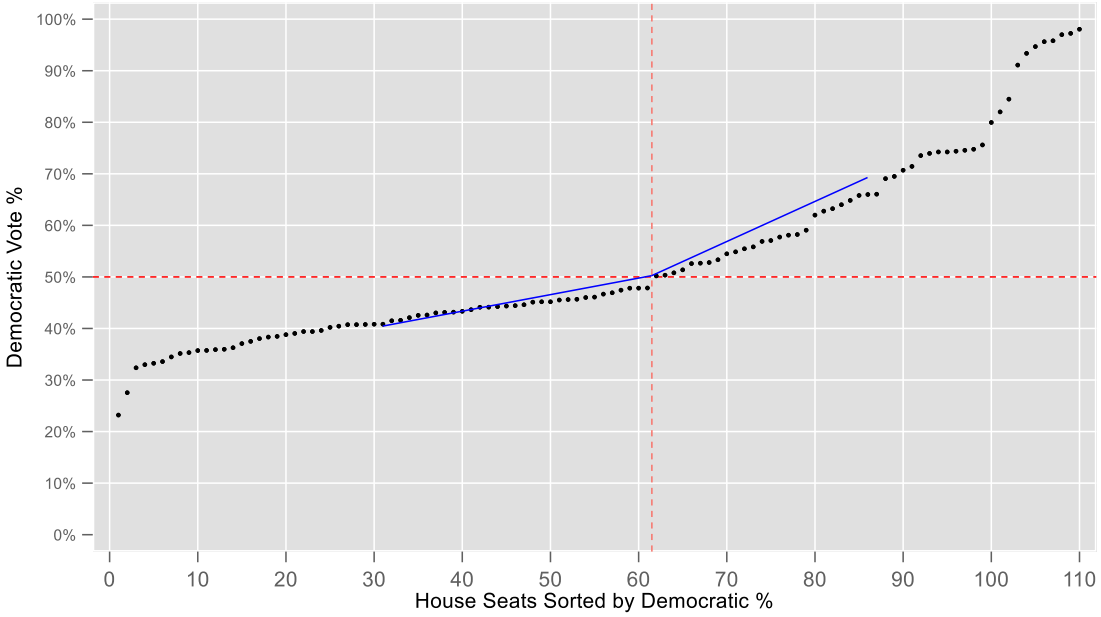


Figure 16
MI Lower House Declination
2012-2016 Data



The plots show the large number of Republican districts (those below the 50% vote share point on the y-axis) between 40-50% of the Democratic vote, and visually display the

disparities in the number of districts below 30% Democratic vote and the number above 70% of the Democratic vote (19 in 2006-2010, and 21 in 2012-2016).

e. Effect of Majority-Minority Districts

The enacted Lower House plan created 12 majority African American districts (House districts 1-10, 34, and 35). To assess whether these districts are responsible for the degree of partisan bias and asymmetry in the enacted plan, I replicated the analysis removing them from the data:

Table 8
Michigan State Lower House
Statewide Election Baseline
Excluding Majority-Minority Districts (12)

	2006-2010	2012-2016
Number of Districts	98	98
Democratic Share of Statewide Vote	49.1%	48.3%
Seats Won By Democrats	37	37
Democratic Share of Seats	37.8%	37.8%
Partisan Bias, actual	-11.3%	-10.6%
Partisan Bias at 50%	-8.2%	-12.2%
Republican Seats won at Democratic Vote Share	53	55
Republican Share of Seats at Democratic Vote Share	54.1%	56.1%
Democratic Vote Share Needed to Win Majority of Seats	52.4%	53.1%
Efficiency Gap	-12.5%	-10.3%
Mean-Median	-3.0%	-3.6%
Average Democratic Win %	61.7%	62.3%

Average Republican Win %	57.6%	59.4%
Declination	0.200	0.181

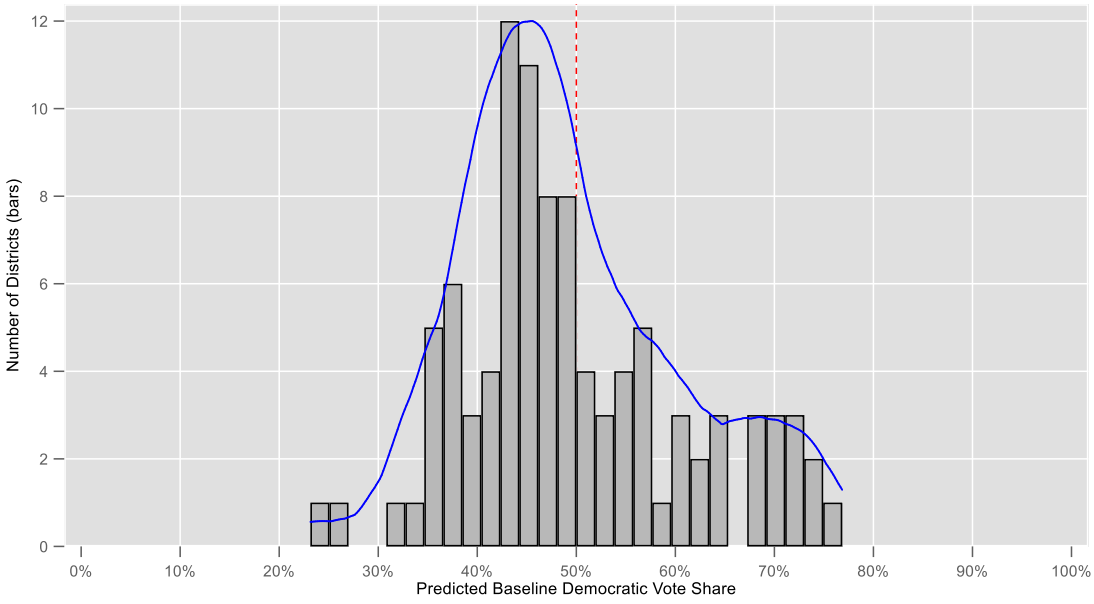
The recalculated metrics for the rest of the state (outside the Majority-Minority districts) show that on nearly every measure, the partisan bias and asymmetry are just as apparent. While the Democratic vote share declines to just below 50% (a drop of about 4 percentage points), its seat share drops from 44.5% to 37.8%, a disproportionate decline. The partisan bias of the map increases significantly from –8.4% (2006-2010) and -7.7% (2012-2016) to -11.2% and -10.6, respectively. Asymmetry, measured by the number of seats won by each party at the equivalent share of the vote, show that Republicans win either 53 or 55 seats at the vote share the Democrats received (compared to 37 Democratic seats).

The efficiency gap decreases only slightly, from -13.6% to -12.3% (2006-2010) and from -11.9% to -10.4% (2012-2016); the values in the non-VRA districts remain more extreme than the 8% threshold.

Democrats still require above a majority of the statewide vote (52.3% and 53%) in order to win a majority of seats.

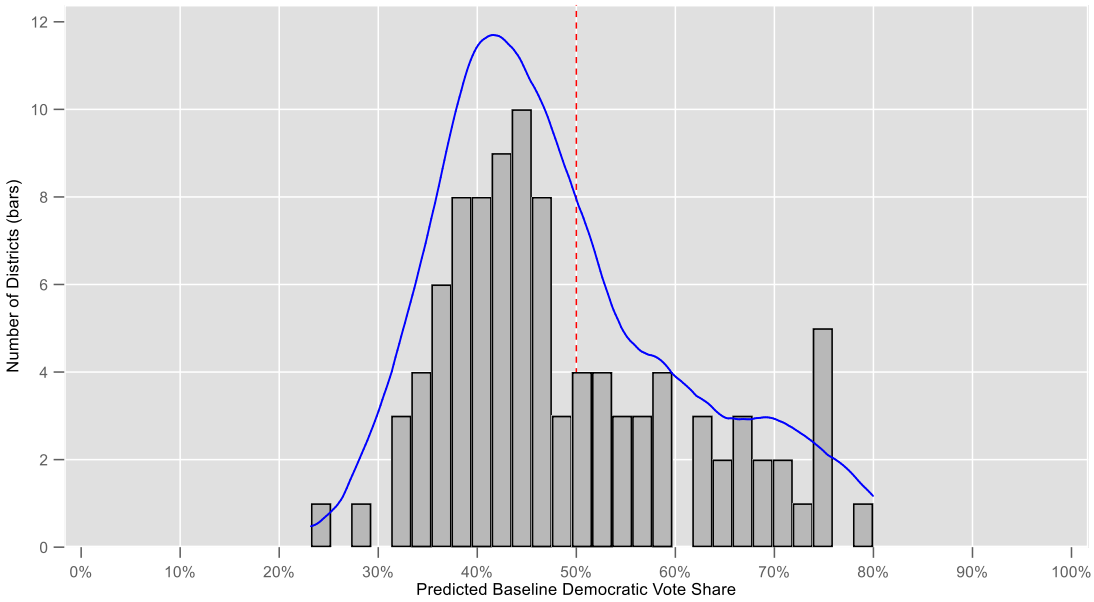
Packing and cracking remain evident from the histogram and kernel density graphs of the district vote shares:

Figure 17
Distribution of Michigan Lower House Districts Excluding Majority Minority Districts
2006-2010 Baseline



Kernel density (blue line) weighted by total district vote

Figure 18
Distribution of Michigan Lower House Districts Excluding Majority Minority Districts
2012-2016 Baseline



Kernel density (blue line) weighted by total district vote

Both sets of data show a high concentration of Republican districts in the 40-50% range of the Democratic vote share (an indicator of cracking), a much smaller number of Democratic

districts in the 50-60% vote share range, and a disproportionately large number of Democratic districts above 60%.

The declination is lower than the equivalent measure for all districts, but the difference in slope is still visible:

Figure 19
MI Lower House Declination Excluding Majority-Minority Districts
2006-2010 Data

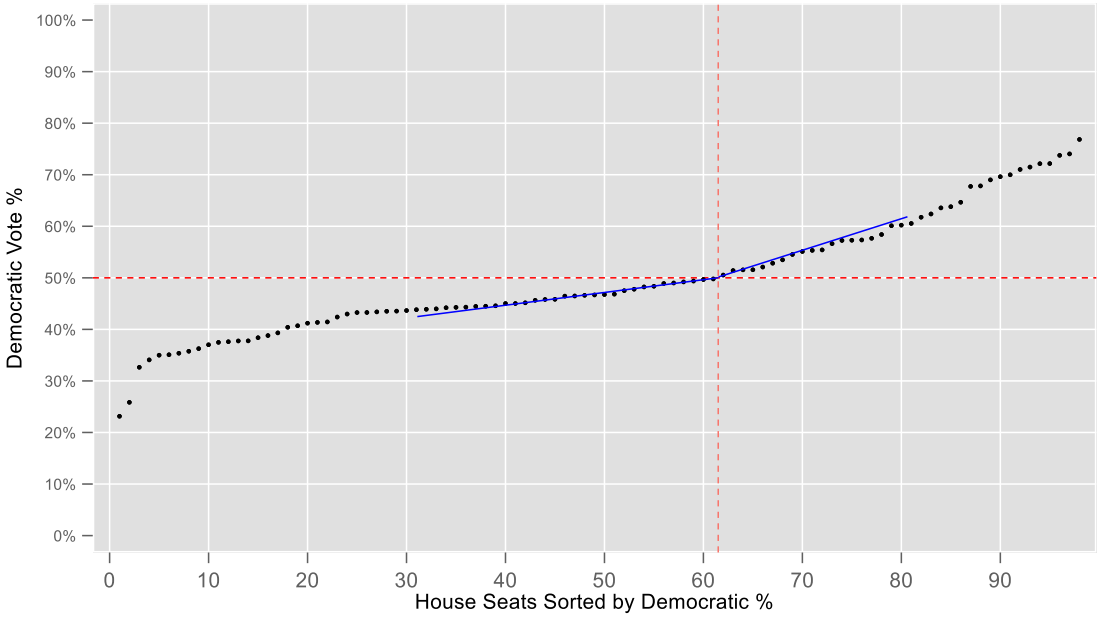
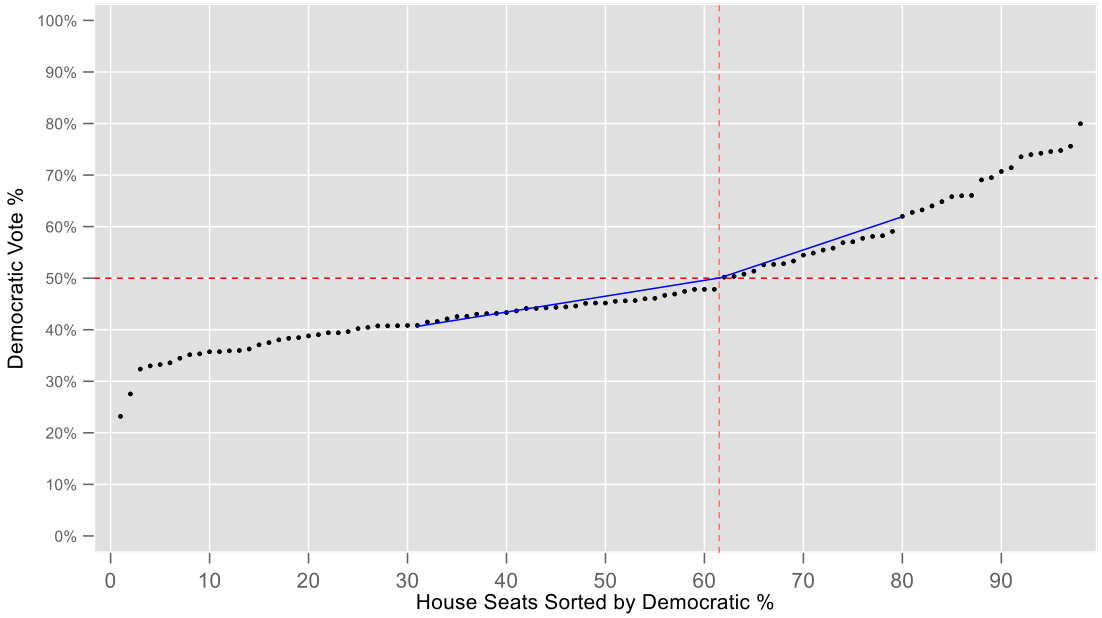


Figure 20
MI Lower House Declination Excluding Majority-Minority Districts
2012-2016 Data



Even after removing the VRA districts, a much larger fraction of Democratic districts are above 70% vote share (7 of 37 in 2006-2010, or 19%; and 9 of 37 in 2012-2016, or 24.3%) than of Republican districts (2 of 61, or 3.3%).

3. State Senate

The Michigan State Senate has 38 districts. Senate elections are held in non-presidential even-numbered years, so there has been 1 Senate election in the post-2011 redistricting cycle. In 2014, Democratic candidates won 49.3% of the actual vote and 11 seats. There were no uncontested seats.

Table A3 in Appendix 1 shows the baseline district-level Democratic vote shares in each state Senate district.

Table 9 shows the metrics for the State Senate Map. Note that these measures are all conservative, because the baseline data shows Democrats winning in 15 districts using 2006-2010 data and 14 using 2012-2016, when in the actual 2014 elections Democrats won only 11 seats (28.9% seat share) with 49.3% of the vote. The observed actual bias in 2014 was -20.4, the efficiency gap (calculated using the simplified formula) was -18.3%., the mean-median was -7.1%, and the declination was .491.

Table 9
Michigan State Senate
Statewide Election Baseline

	2006-2010	2012-2016
Democratic Share of Statewide Vote	53.2%	52.3%
Seats Won By Democrats	15	14
Democratic Share of Seats	39.5%	36.8%
Partisan Bias, actual	-13.7%	-15.5%
Partisan Bias at 50%	-13.2%	-15.8%
Republican Seats won at Democratic Vote Share	27	27
Republican Share of Seats at Democratic Vote Share	71.1%	71.1%
Democratic Vote Share Needed to Win Majority of Seats	56.1%	55.7%
Efficiency Gap	-18.0%	-19.3%
Mean-Median	-6.3%	-6.1%
Average Democratic Win %	67.9%	69.5%
Average Republican Win %	55.8%	56.9%
Declination	0.348	0.380

a. Partisan Bias and Asymmetry

Like the U.S. House and Michigan lower House maps, the state Senate map has a high degree of partisan bias and asymmetry. Despite obtaining a majority of the statewide vote, Democrats win less than 40% of seats using either the 2006-2010 or 2012-2016 data (15 of 38 using 2006-2010, and 14 of 38 using 2012-2016). Partisan bias at the 50% vote split runs from -13.2% to -15.8%, showing that Republicans win supermajorities with an even vote (24 seats or 25 seats, over 60% using both data sets). Republicans win 27 seats with the Democratic vote share (compared to the 15 and 14 that Democrats win).

Democrats need to win over 56.1% of the vote using 2006-2010 data, and 55.7% using 2012-2016 to win a majority of seats.

b. Efficiency Gap

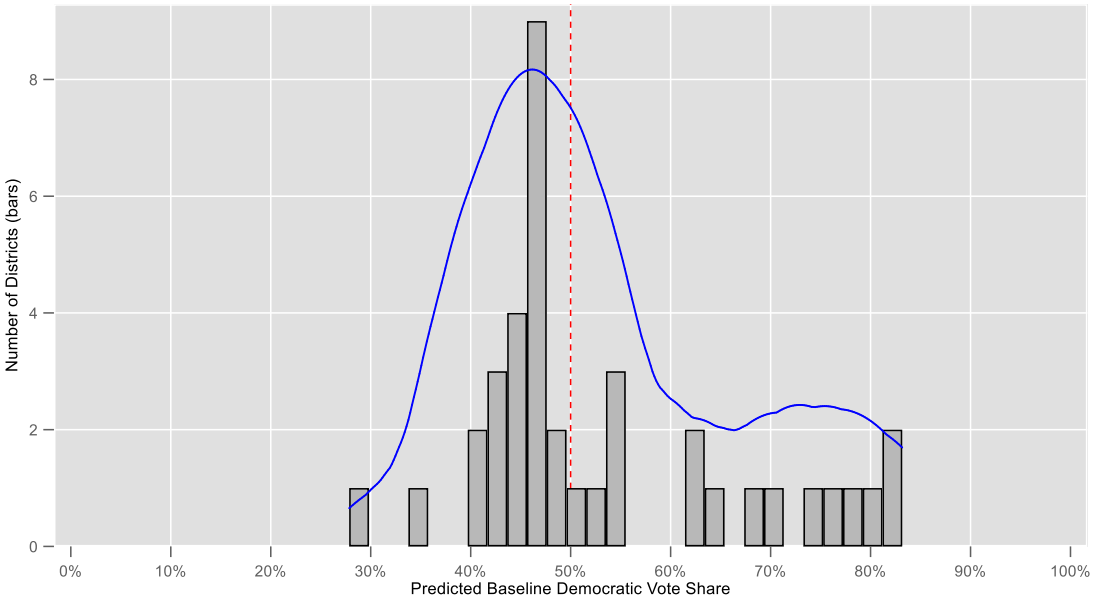
The full Efficiency Gap calculations are -18.0% using 2006-2010 data and -19.3% using 2012-2016 data.

c. Mean-Median

The mean-median test shows a high degree of unequal vote weighting, with a value of -6.3% using 2006-2010 data and -6.1% using 2012-2016 data. Combined with the counter-majoritarian result, this metric indicates a large and durable imbalance.

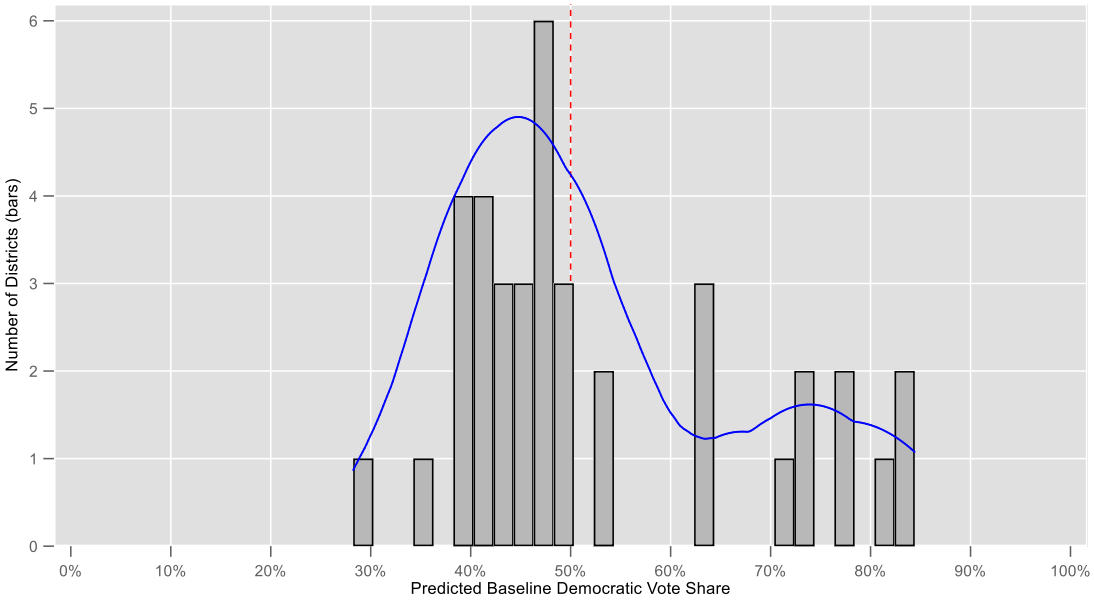
A histogram of district data confirms this. Both the 2006-2010 and 2012-2016 graphs show a high concentration of Republican districts in the 40-50% Democratic vote share range, very few Democratic districts in the equivalent range (50-60% Democratic share), and a much larger number of safe Democratic districts above 60%. 11 of 15 Democratic districts (or 73.3%) are above 60% vote share in both 2006-2010 and 2012-2016, compared to 2 of 21 Republican districts in 2006-2010 (9.5%) and 4 of 21 in 2012-2016 (19%) of Republican districts in that safe range (above 60% Republican vote share).

Figure 21
Distribution of Michigan State Senate Districts
2006-2010 Baseline



Kernel density (blue line) weighted by total district vote

Figure 22
Distribution of Michigan State Senate Districts
2012-2016 Baseline



Kernel density (blue line) weighted by total district vote

The kernel density curves show how unbalanced and asymmetric the district distribution is. Again, as with the US House and Michigan lower House, density is highest at about 43-

44% of the Democratic vote (indicating cracking), and there is a large tail at the right side of the distribution, indicating packing of Democratic voters.

d. Declination

Declination measures show a clear bias, with metrics of .348 (2006-2010) and .380 (2012-2016). The pattern is obvious in the graphs of ranked Democratic vote share, with obviously different slopes on either side of 50% vote. The plots demonstrate the packing and cracking in the plan, with most Republican districts located at between 40 and 50% of the vote share, compared to only 4 Democratic districts.

Figure 23
MI State Senate Declination
2006-2010 Data

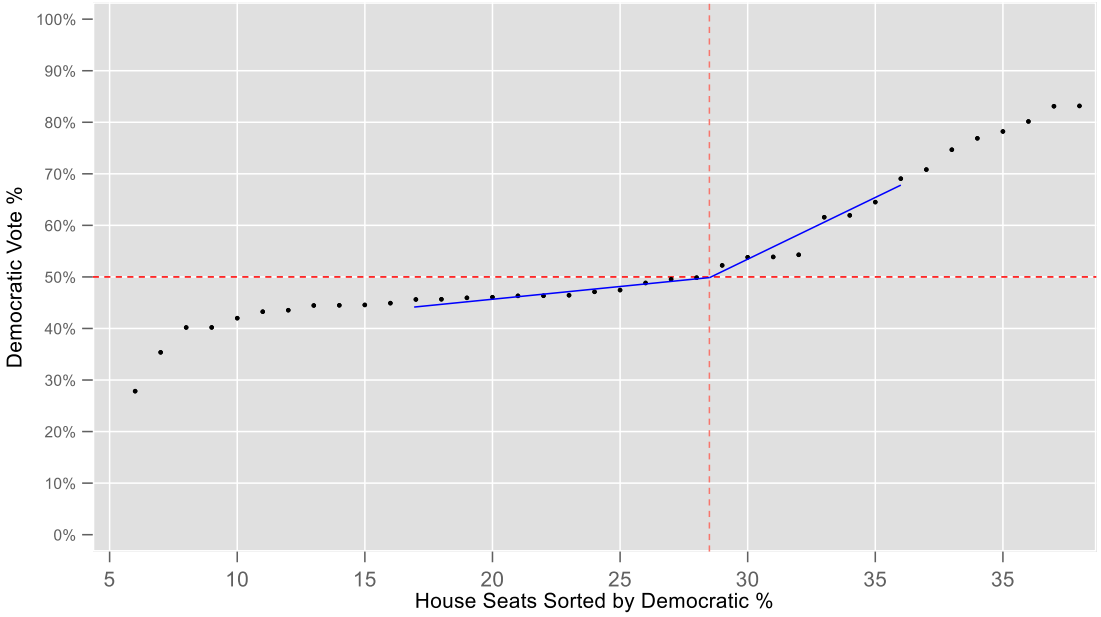
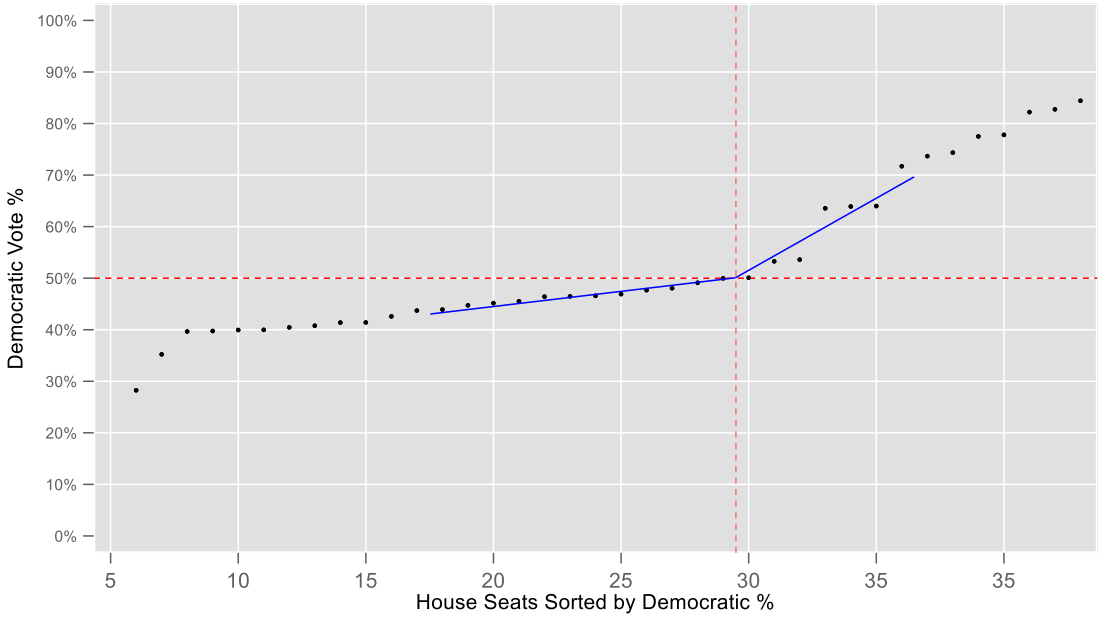


Figure 24
MI State Senate Declination
2012-2016 Data



e. Effect of Majority-Minority Districts

The enacted Senate plan created five majority African American districts (districts 1-5). Removing them from the analysis does not have any appreciable effect on the metrics of gerrymandering, as shown in table 10.

Table 10
Michigan State Senate
Statewide Election Baseline
Excluding Majority-Minority Districts (5)

	2006-2010	2012-2016
Number of Districts	33	33
Democratic Share of Statewide Vote	49.4%	48.6%
Seats Won By Democrats	10	9
Democratic Share of Seats	30.3%	27.3%
Partisan Bias, actual	-19.1%	-21.3%

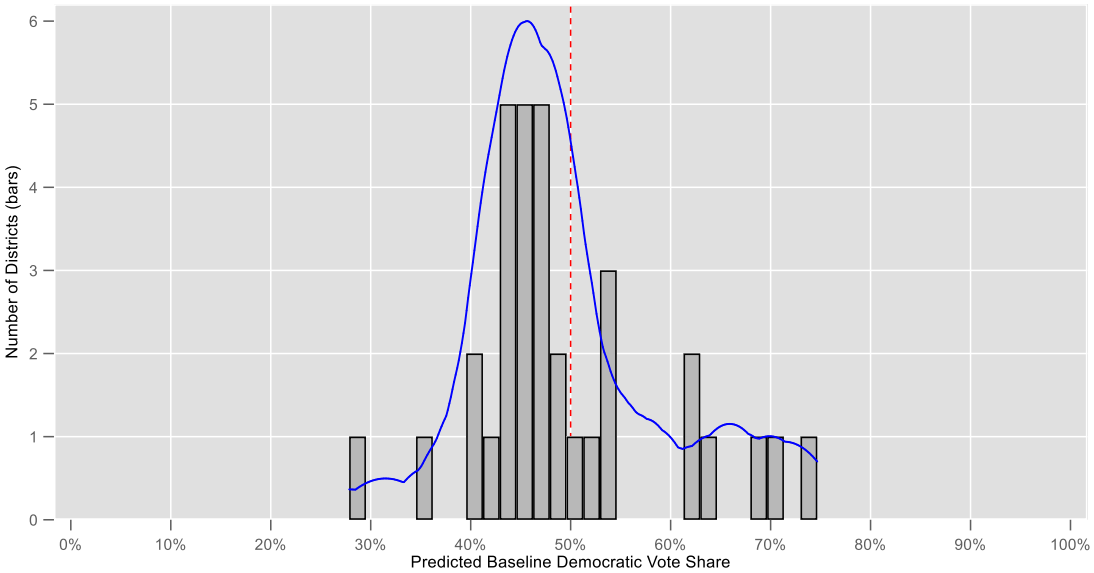
Partisan Bias at 50%	-13.6%	-16.7%
Republican Seats won at Democratic Vote Share	20	20
Republican Share of Seats at Democratic Vote Share	60.6%	60.6%
Democratic Vote Share Needed to Win Majority of Seats	53.0%	52.2%
Efficiency Gap	-19.0%	-20.3%
Mean-Median	-3.1%	-2.1%
Average Democratic Win %	61.7%	63.1%
Average Republican Win %	55.8%	56.9%
Declination	0.313	0.368

Most of the metrics – the partisan bias, asymmetry, and efficiency gap – show *more* evidence of partisan gerrymandering, again because while the Democratic aggregate vote share declines slightly (by about 4 percentage points), the Democratic seat share plunges to 30.3% of seats, as Democrats had won all five of the majority-minority districts). Republicans win twice as many seats (20) at the Democratic vote share as the Democrats won (10), controlling a supermajority of 20 of 33 seats at less than 50% of the vote. The observed partisan bias becomes larger in favor of Republicans, from -13.7% and 15.5% in the full statewide plan, to -19.1 and -21.3% when the majority-minority districts are excluded from the analysis.

The only metrics that improve are the mean-median measure, which drops to -3.1% and -2.1%, reflecting the drop off occurring after the most Democratic seats are excluded; the aggregate vote that the Democrats need to win a majority of seats, which drops to 53.0% and 52.2%; and the declination, which declined marginally to .313 and .368 . All of these metrics continue to show, however, clear evidence of bias and unequal vote weights applied to Democratic and Republican voters.

The distribution of district vote shares continues to show evidence of packing and cracking, with the Republican districts unchanged and still concentrated in the 40-40% vote share range, and Democratic districts continued to be concentrated above 50%. The asymmetry remains apparent:

Figure 25
Distribution of Michigan State Senate Districts
Excluding Majority-Minority Districts
2006-2010 Baseline



Kernel density (blue line) weighted by total district vote

Figure 26
Distribution of Michigan State Senate Districts
Excluding Majority-Minority Districts

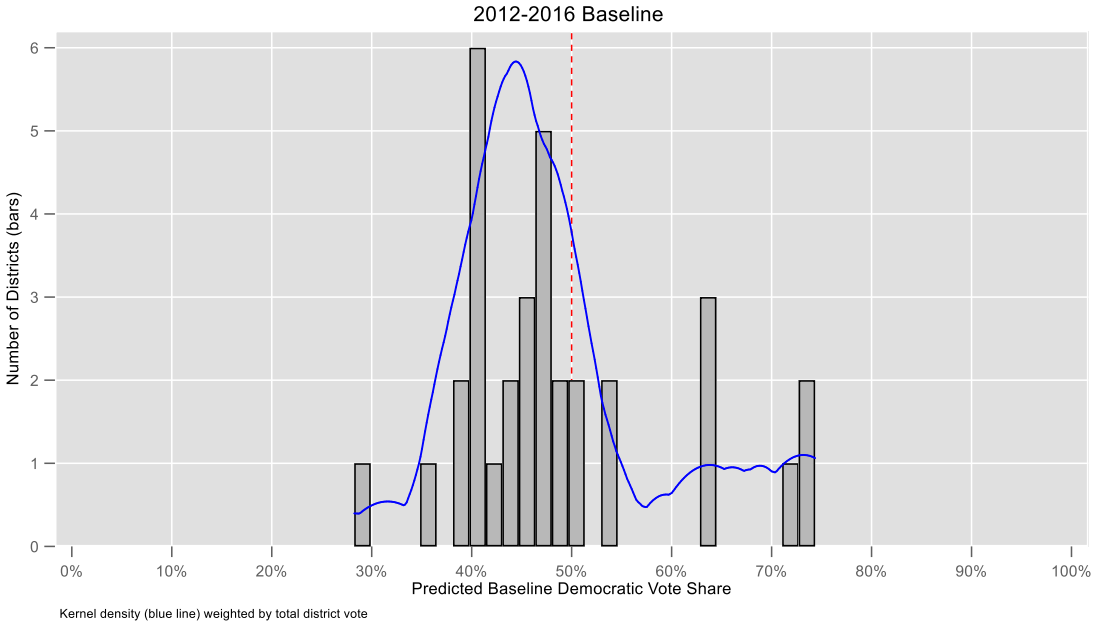


Figure 27
MI State Senate Declination
Excluding Majority-Minority Districts
2006-2010 Data

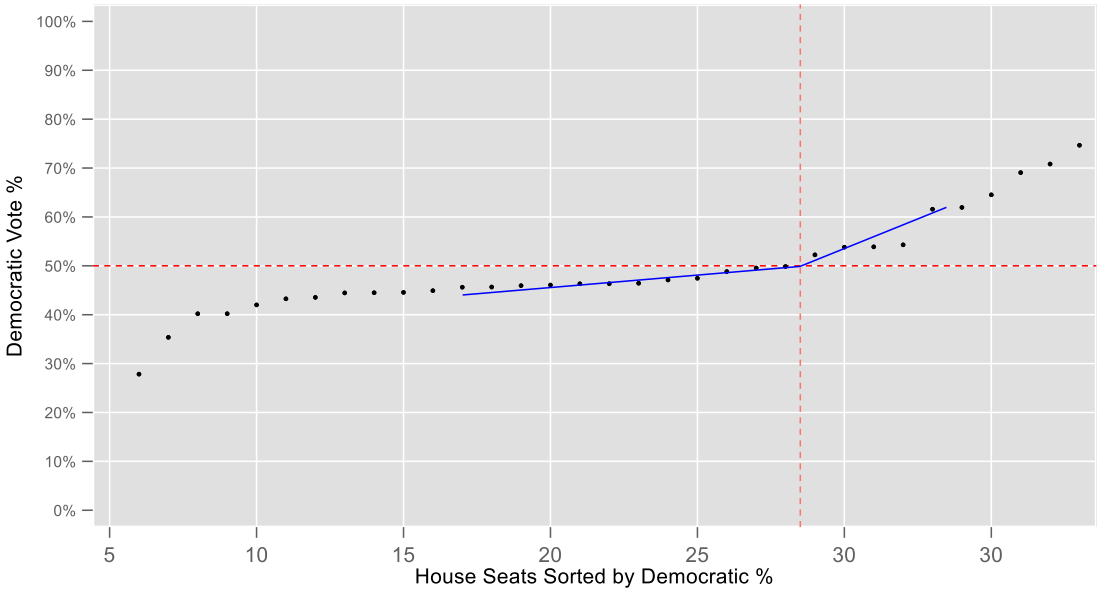
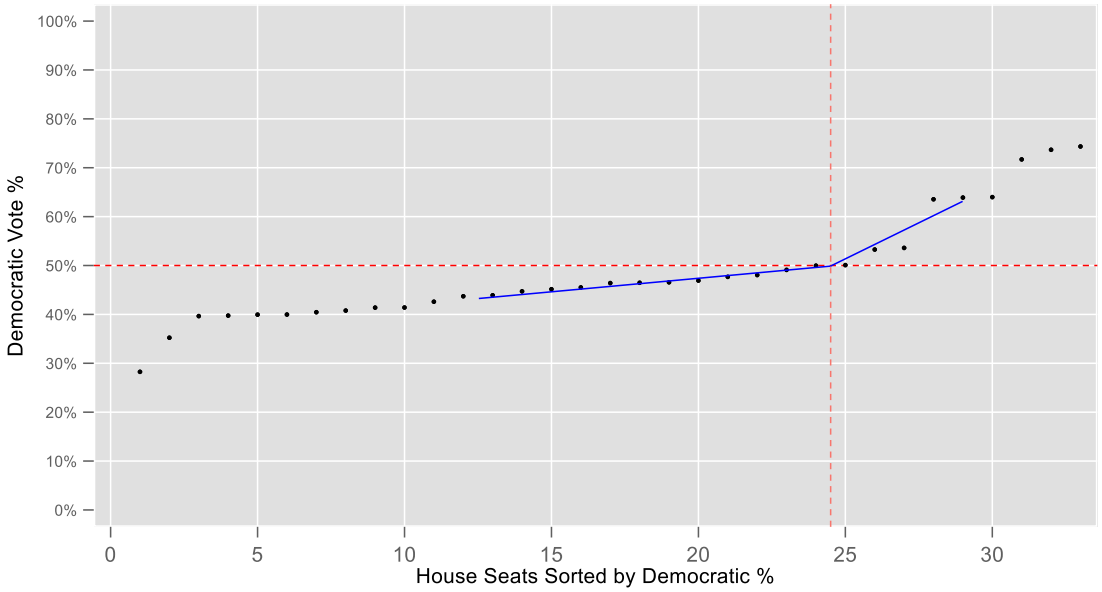


Figure 28
MI State Senate Declination
Excluding Majority-Minority Districts
2012-2016 Data



4. Summary

By every metric, the Michigan district plans for the U.S. House, state lower House, and state Senate constitute large and durable partisan gerrymanders. The maps are biased, asymmetric in that they uniformly award Republicans more seats than the Democrats at equivalent vote percentages, require Democrats to win more than a majority of the vote to win a majority of seats, pack Democrats into a small number of districts where they constitute large majorities, and split Democrats into districts where they are a minority of voters.

The partisan nature of these gerrymanders is not due to the existence of majority-minority districts; the bias and asymmetry persist even when these are excluded from the analysis. In fact, many metrics are worse when applied to areas of the state outside of the VRA districts.

E. Evaluation of Demonstration Map

To analyze the demonstration maps, I assigned each Census block to districts created by Dr. Chen, and then repeated the analysis in sections D(1) through D(3) above. Rather than include separate sections for each metric and the VRA analysis, I have combined the tables and graphs for each level of districting.

1. U.S. House of Representatives Map

The metrics for the U.S. House demonstration map are shown in table 11. The map is more balanced than the actual map. The Democratic share of the aggregate vote does not change in the statewide map between the actual and demonstration map, and provides a baseline of comparison.

Table 11
Michigan US House of Representatives
Demonstration Plan Statewide Baseline

	2006-2010		2012-2016	
	Statewide	Excluding VRA (2)	Statewide	Excluding VRA (2)
Number of Districts	14	12	14	12
Democratic Share of Statewide Vote	53.2%	48.5%	52.3%	47.6%
Seats Won By Democrats	8	6	6	4
Democratic Share of Seats	57.1%	50.0%	42.9%	33.3%
Partisan Bias, actual	4.0%	1.5%	-9.4%	-14.2%
Partisan Bias at 50%	-14.3%	0.0%	-14.3%	0.0%
Republican Seats won at Democratic Vote Share	12	5	10	5
Republican Share of Seats at Democratic Vote Share	85.7%	41.7%	71.4%	41.7%
Democratic Vote Share Needed to Win Majority of Seats	52.9%	50.1%	53.5%	50.4%

Efficiency Gap	0.1%	2.3%	-12.6%	-12.2%
Mean-Median	-2.5%	0.7%	-3.4%	0.3%
Average Democratic Win %	60.3%	53.2%	63.5%	54.0%
Average Republican Win %	56.0%	56.0%	55.5%	55.5%
Declination	0.048	-0.069	0.237	0.044

With 53.2% of the statewide vote (2006-2010), Democrats win three additional seats under the demonstration map, winning a slight majority (8/14). The partisan bias (+4.0%, indicating a bias in favor of Democrats) is more consistent with the normal premium majority parties receive. Even in absolute terms, 4.0% is much smaller than the -17.5% observed in the actual map using the baseline vote (table 5). The bias at a 50-50 vote share is the same under the demonstration map as in the actual map (-14.3%), due to the existence of three districts (5, 11, and 12; *see* table A4) with between 50% and 51.9% Democratic vote. As the shift to 50% statewide requires a uniform swing of -3.2% in each district, these three districts flip from Democratic to Republican control, leaving the Democrats with only 5 seats (35.6% seat share). There is still asymmetry in the plan, as Republicans win 12 seats at the Democratic vote share, but the discrepancy (4 seats) is smaller than what is estimated in the actual plan (5 seats).

Using the 2006-2010 data, under the demonstration plan, Democrats win a majority of seats (8) at 52.9% of the vote. Between 52.9% and 51.9% of the vote seats are split 7-7 between the parties, since district 12 has a baseline Democratic vote share of 50.1% and flips to Republican control after a small shift toward Republicans. Democrats slip to 6 seats at 51.9% of the statewide vote, losing the seat majority outright.

The efficiency gap of the demonstration plan is 0.1%, which is not meaningfully distinct from 0. The mean-median is -2.5%, continuing to indicate a slight Republican bias, but is much lower than the -6.8% in the enacted map.

The declination (0.048) is, for all practical purposes, indistinguishable from 0, and is almost ten times smaller than the comparable value for the enacted plan (.415).

The 2012-2016 data show more mixed results compared to 2006-2010. Some metrics, indicate some partisan imbalance: the efficiency gap (-12.6%), declination (0.237), and observed partisan bias (-9.4%). But the metrics are all improved from the enacted map, which has an efficiency gap of -19.7%, a declination of 0.398, and observed partisan bias of -16.6%.

The partisan balance of the map is observable from the vote share histograms. The number of districts immediately on either side of 50% has become more equal, with 6 Republican districts between 50-60% Republican (meaning 40-50% Democratic), and 6 districts between 50-60% Democratic. Apart from the two most Democratic districts (at around 80%), the density is mostly symmetric around the 50% point in 2006-2010, more balanced using the 2012-2016 data than the enacted map (shown in figure 6).

Figure 29
Distribution of Michigan U.S. House Districts - Demonstration Plan
Predicted Baseline Vote using 2006-2010 Data

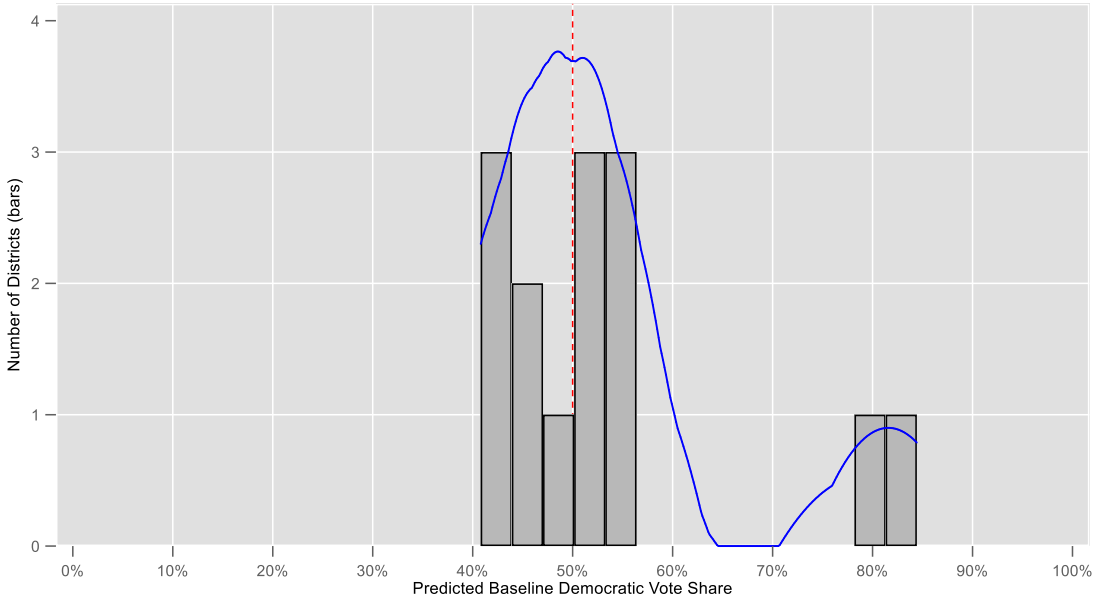
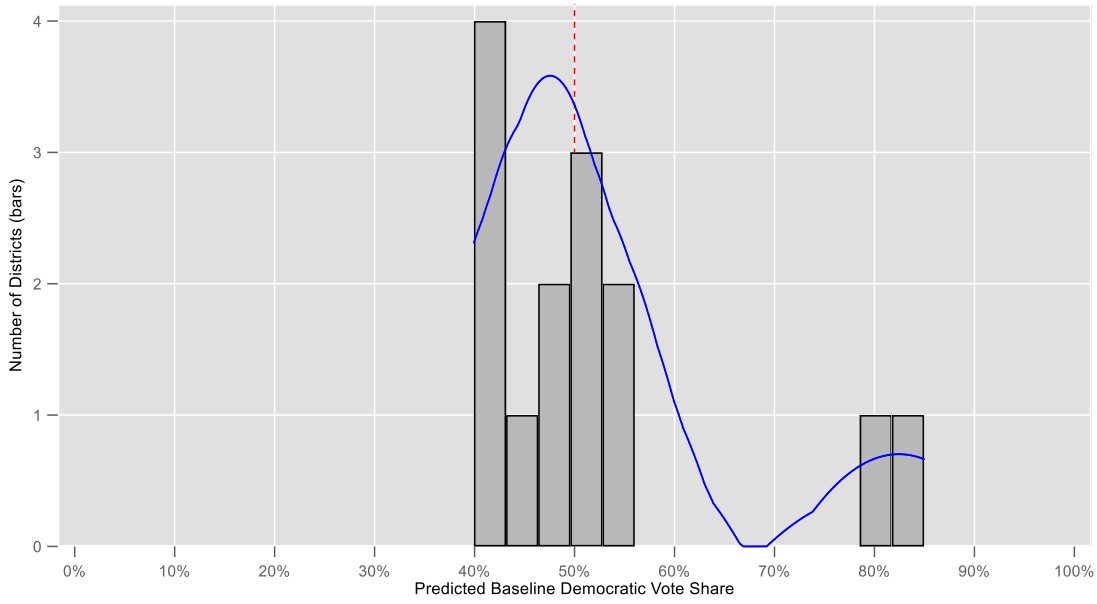


Figure 30
Distribution of Michigan U.S. House Districts- Demonstration Plan
Predicted Baseline Vote Using 2012-2016 Data



The

The plot of the declination measure shows that the two lines (on either side of the point where districts flip from Republican to Democratic wins) is largely indistinguishable from a single straight line in 2006-2010 (figure 31). The 2012-2016 data shows an observable difference in slope.

Figure 31
US House Declination- Demonstration Plan
Predicted Baseline Vote Using 2006-2010 Data

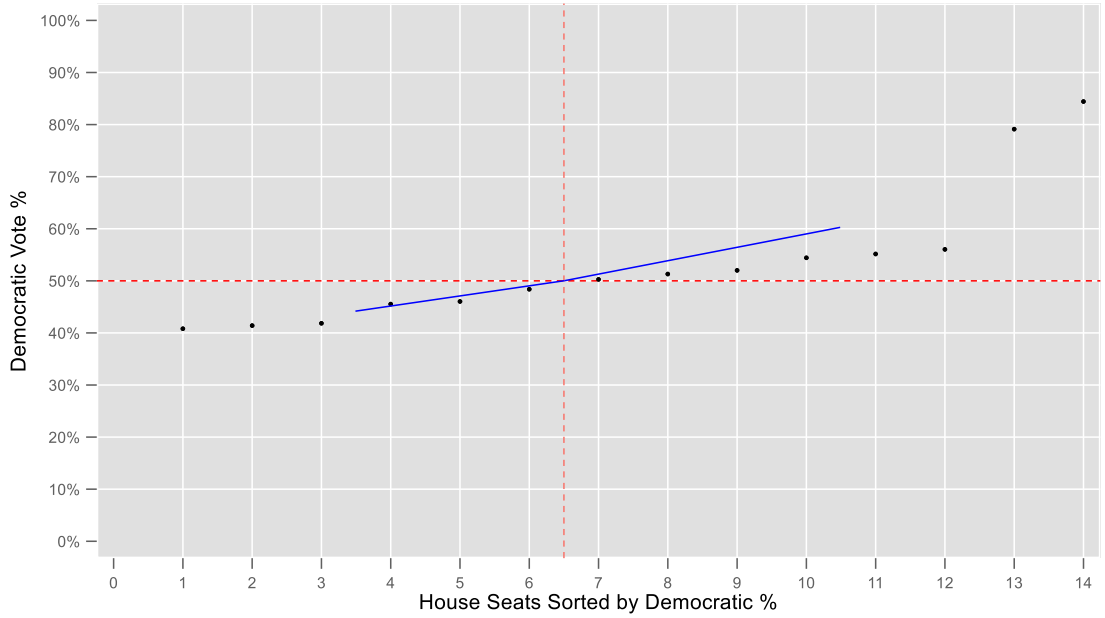
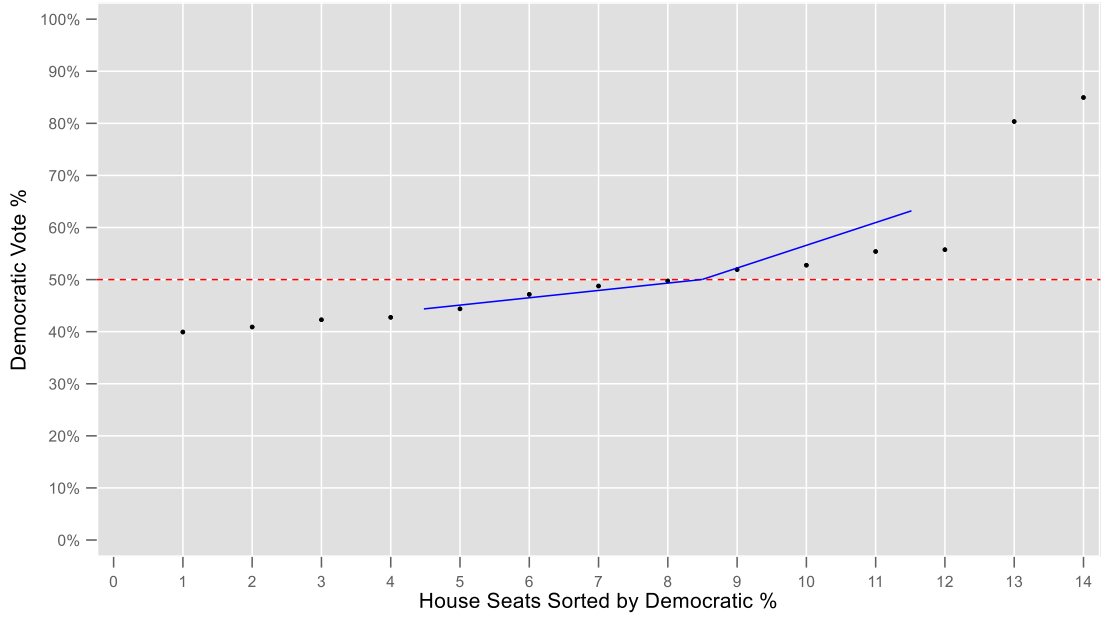


Figure 32
US House Declination- Demonstration Plan
Predicted Baseline Vote Using 2012-2016 Data



However, to the extent that there is *any* bias or asymmetry in the map, it is the result of the two Voting Rights Act districts. When they are removed (in columns three and five in table 11), the metrics for 2006-2010 show no evidence of partisan bias or asymmetry (in fact,

the bias at 50-50 drops to zero, and the 6 seats Republicans win at the Democratic vote share is close to the 5 seats that Democrats won). The efficiency gap (2.3), mean-median (0.7%) and declination (-0.069) show the map to be as balanced as one could reasonably achieve. For 2012-2016, the pattern is similar. The partisan bias of the map is -14.3% because the Democrats win 4 seats (33.3% share) rather than 6 (50% share), and the efficiency gap remains close to its value in the full state map (-.12.2%). However, some of this is due to the competitiveness of the demonstration plan: Democrats narrowly lose two seats by margins of 50.3-49.7% and 51.8-48.2%, which increases the number of wasted Democratic votes (recall that all votes cast for losing candidates are defined as wasted).

Even under the 2012-2016 data, the partisan bias of the demonstration plan disappears at the 50-50 split (with a value of 0), the mean-median is miniscule (0.3%), the declination is 0.044, and the map is mostly symmetrical, with Republicans winning 5 seats at the Democratic vote percentage (compared to the 4 that Democrats won).

The histogram and kernel density graphs show the same pattern (figures 33 and 34). The distribution is more balanced, and the kernel density curves now have two peaks, one immediately to the left of 50% vote, and another to the right. All of the districts are concentrated in the 40-50% vote share for each party.

Figure 33
Distribution of Michigan U.S. House Districts - Demonstration Plan
Excluding Majority-Minority Districts

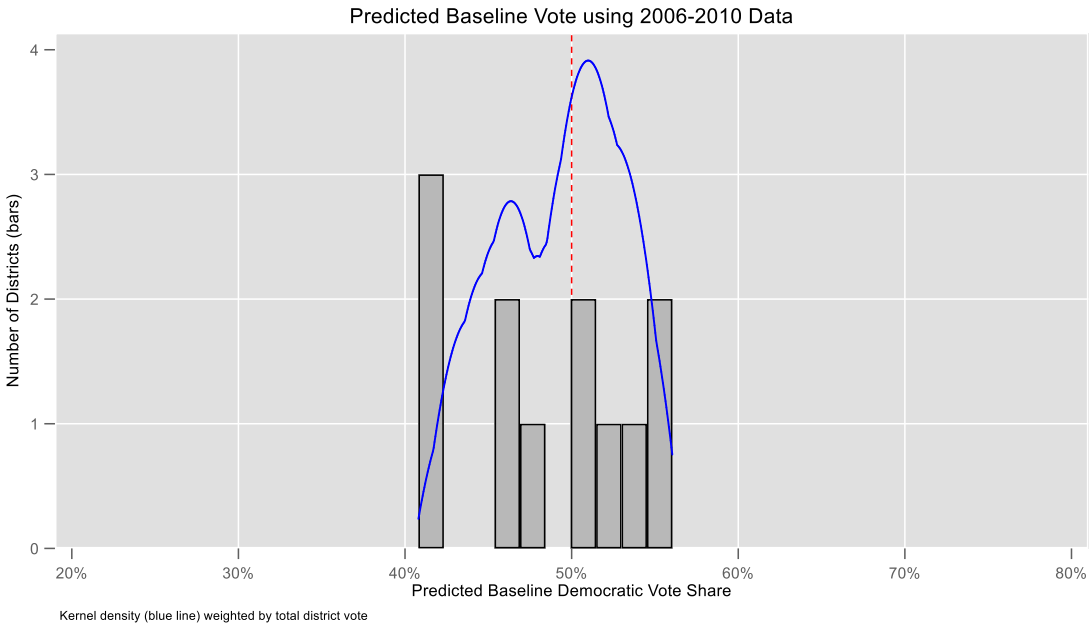
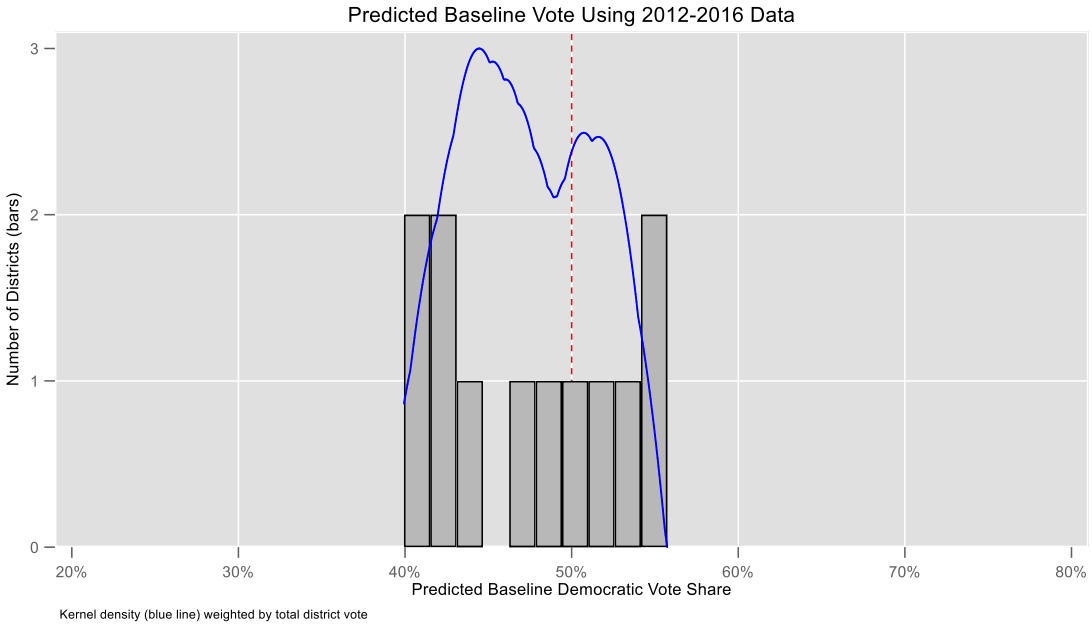


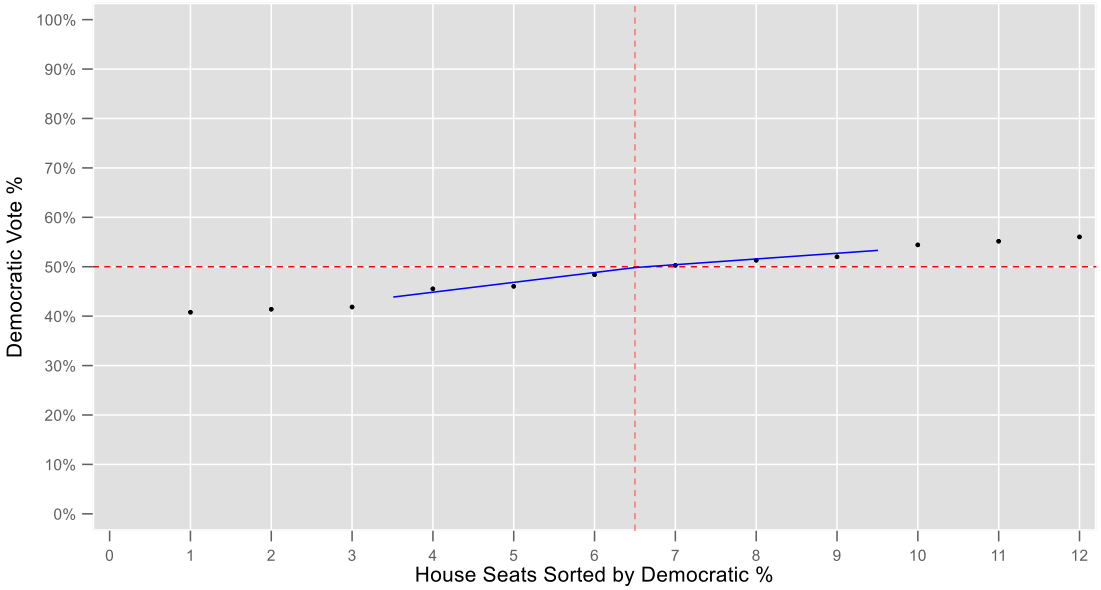
Figure 34
Distribution of Michigan U.S. House Districts- Demonstration Plan
Excluding Majority-Minority Districts



The declination graphs, too, show more balance. Figure 35 shows the declination lines for the 2006-2010 data; while there is some visible difference in the slopes (and the slope for

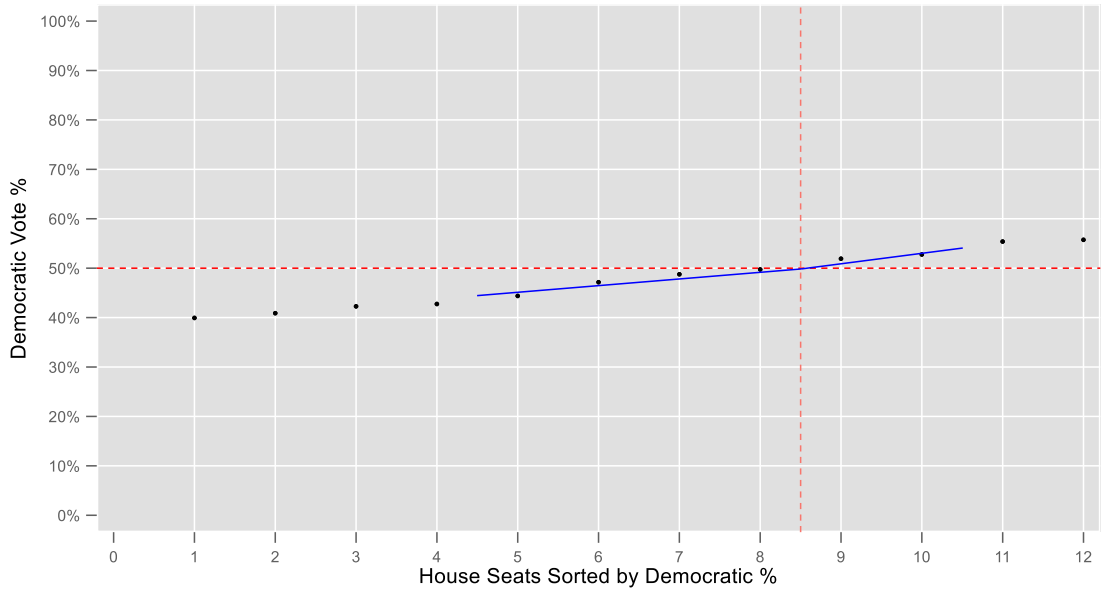
the Democratic districts is slightly smaller, reflecting the negative value of the declination (-0.069), the difference is small.

Figure 35
US House Declination- Demonstration Plan
Excluding Majority-Minority Districts
Predicted Baseline Vote Using 2006-2010 Data



The change in line slope for the 2012-2016 data (figure 36) is virtually imperceptible, consistent with its small value (0.044).

Figure 36
US House Declination- Demonstration Plan
Excluding Majority-Minority Districts
Predicted Baseline Vote Using 2012-2016 Data



My conclusion is that the demonstration map does not constitute a partisan gerrymander, and any indicators of partisan bias or asymmetry either disappear entirely when the majority-minority districts are excluded, or show no evidence on several key metrics (partisan bias at 50-50, mean-median, and declination). The remaining metrics reflect the high degree of competitiveness of the map, with most districts balanced at close to 50% partisanship.

2. State House of Representatives

The metrics for the state House plan are shown in table 12.

Table 12
Michigan State House of Representatives
Demonstration Plan Statewide Baseline

	2006-2010		2012-2016	
	Statewide	Excluding VRA (12)	Statewide	Excluding VRA (12)
Number of Districts	110	98	110	98
Democratic Share of Statewide Vote	53.2%	49.1%	52.3%	48.3%
Seats Won By Democrats	52	40	48	36
Democratic Share of Seats	47.3%	40.8%	43.6%	36.7%
Partisan Bias, actual	-5.9%	-8.3%	-8.7%	-11.6%
Partisan Bias at 50%	-10.9%	-2.0%	-10.9%	-6.1%
Republican Seats won at Democratic Vote Share	75	47	70	53
Republican Share of Seats at Democratic Vote Share	68.2%	48.0%	63.6%	54.1%
Democratic Vote Share Needed to Win Majority of Seats	53.6%	51.0%	54.6%	52.4%
Efficiency Gap	-11.2%	-9.5%	-13.2%	-11.7%
Mean-Median	-4.2%	-1.3%	-5.2%	-2.9%
Average Democratic Win %	66.9%	60.4%	69.0%	62.1%
Average Republican Win %	57.9%	57.9%	59.0%	59.0%
Declination	0.209	0.134	0.259	0.193

Under the demonstration plan, some metrics of partisan bias and asymmetry remain, although at levels below the enacted map. Democrats win more seats using the 2006-2010 data (52 compared to 48 in the enacted plan), and the observed bias drops from -8.6% in the enacted plan to -5.9% in the demonstration plan. Using both 2006-2010 and 2012-2016 data, the efficiency gap and mean-median indicate some imbalance in favor of the

Republicans. The declination measures are reduced from the enacted map using 2006-2010 data (from 0.266 to 0.209, a 21.4% decrease), and marginally higher using 2012-2016 data (from 0.243 to 0.259, a 6.6% increase).

Histograms and kernel density curves show more balance. There are more districts in the 50-60% Democratic vote share (20) than in the enacted map (17), and the right tail of the distribution is somewhat less pronounced.

Figure 37
Distribution of Michigan Lower House Districts - Demonstration Plan
2006-2010 Baseline

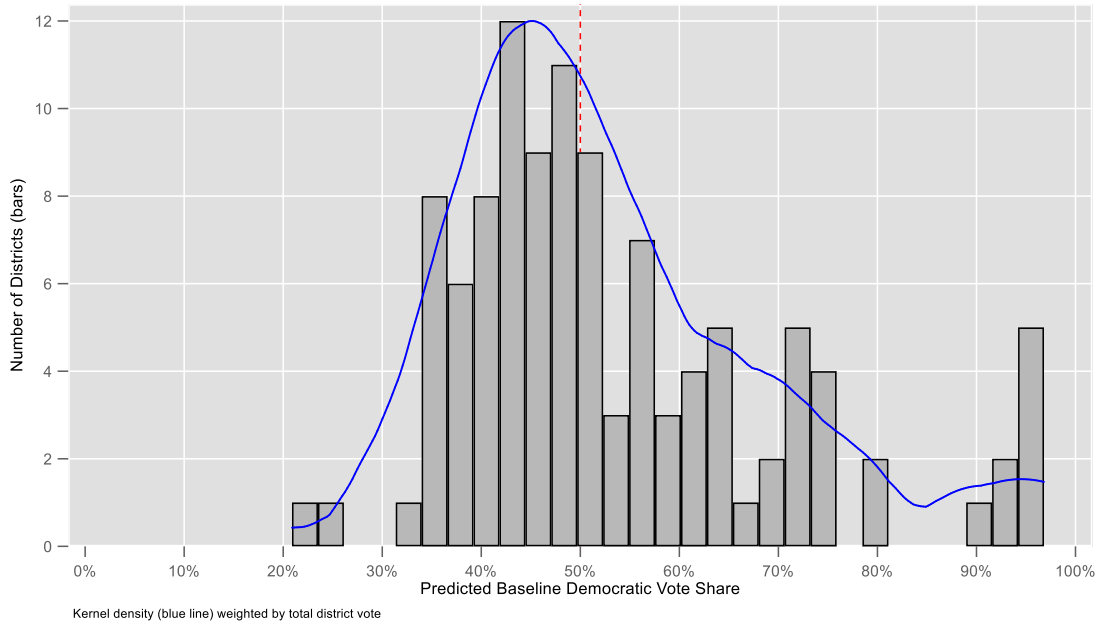
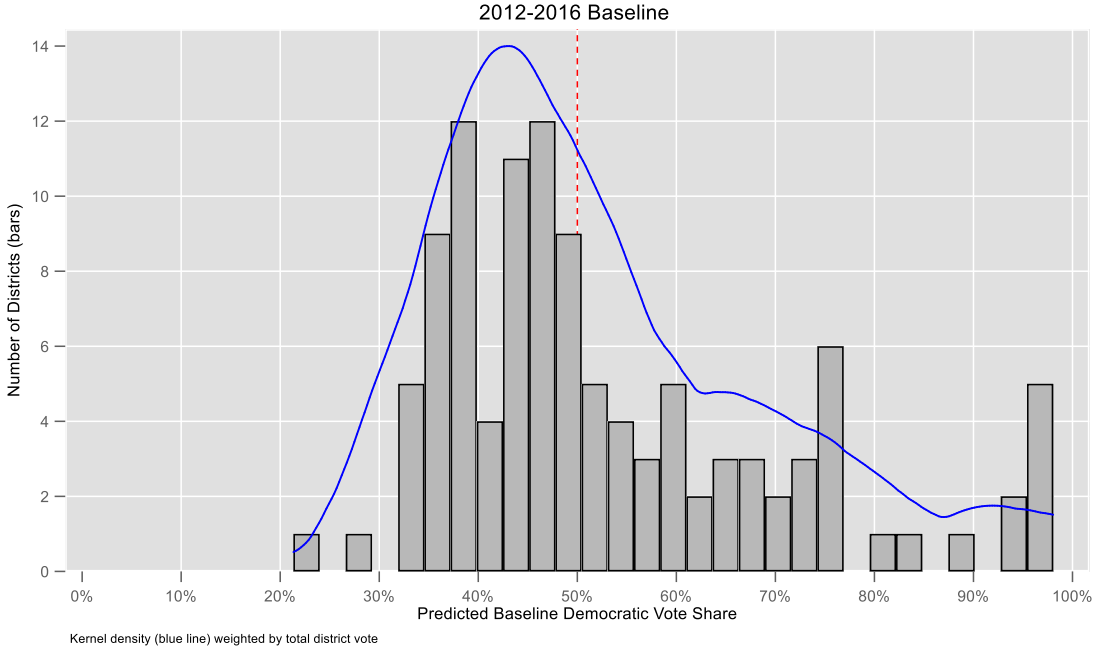


Figure 38
Distribution of Michigan Lower House Districts - Demonstration Plan



The declination graphs show differences in the slopes on either side of 50, although there are more districts between 50-60% Democratic in the demonstration plan (20 using 2006-2010 data and 16 using 2012-2016 data) than in the enacted map (17 and 10, respectively).

Figure 39
MI Lower House Declination - Demonstration Plan
2006-2010 Data

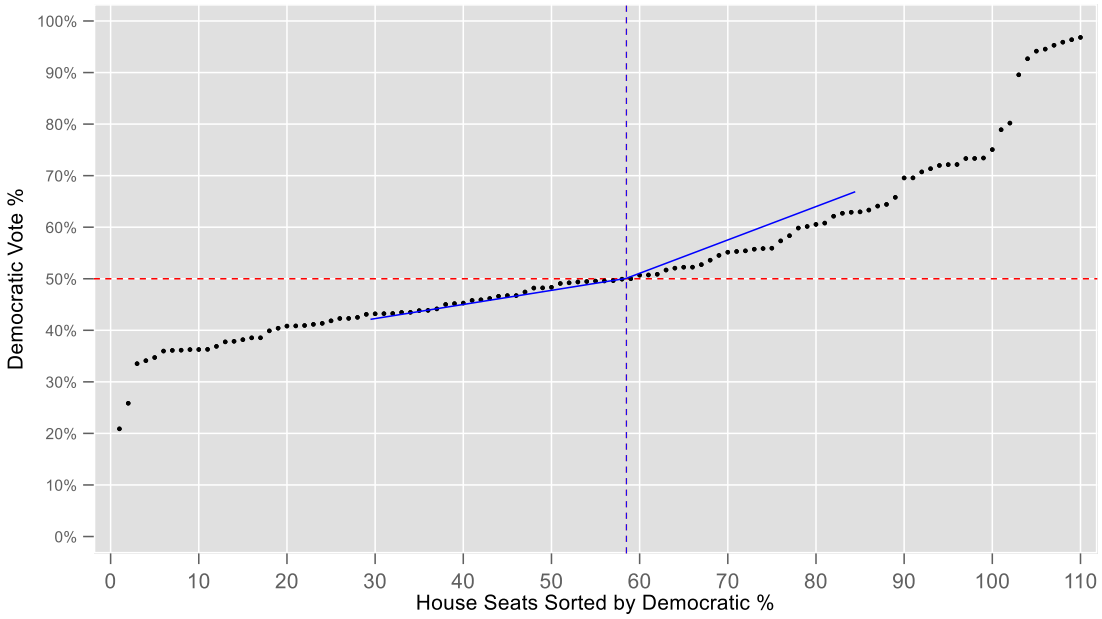
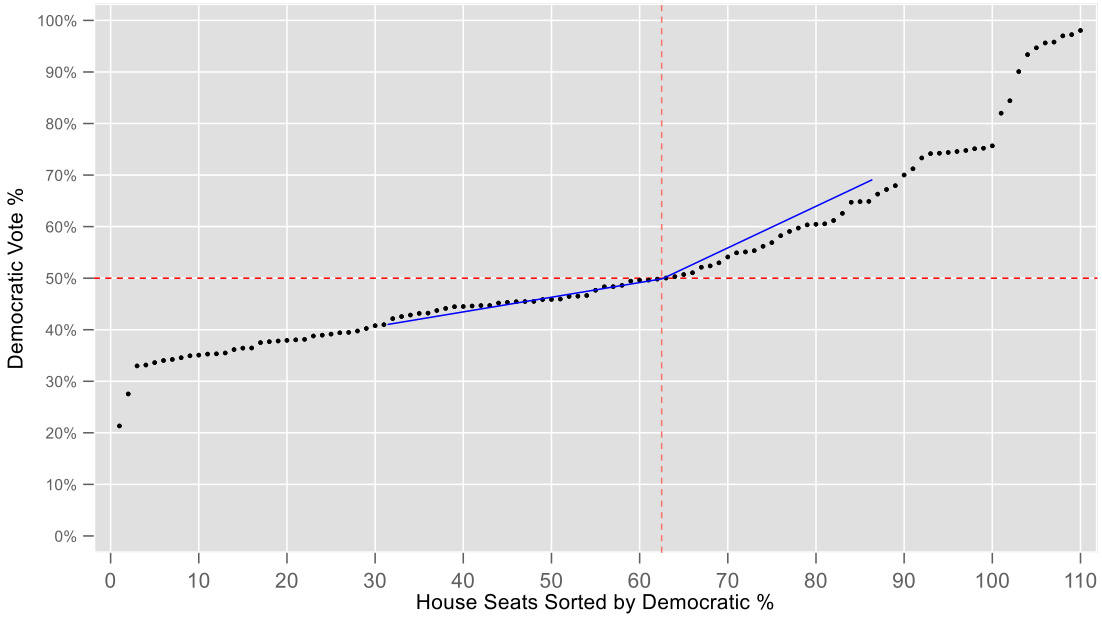


Figure 40
MI Lower House Declination - Demonstration Plan
2012-2016 Data



The metrics become even more balanced when the 12 majority-minority districts are excluded (columns 3 and 5 in table 12). While the observed partisan bias grows (because the Democratic seat share declines more than the vote share), the bias at 50-50 shrinks to -2.0% using 2006-2010 data and to -6.1% using 2012-2016 data, as does the efficiency gap, mean-median, and declination. Asymmetry decreases, with Republicans winning a small number of seats at the Democratic vote share than they do under either the statewide demonstration map or under the enacted map with majority-minority districts excluded.

Histograms and kernel density graphs show that removing the majority-minority districts leaves the distribution more balanced, with a much less pronounced right-hand tail.

Figure 41
Distribution of Michigan Lower House Districts - Demonstration Plan
Excluding Majority Minority Districts

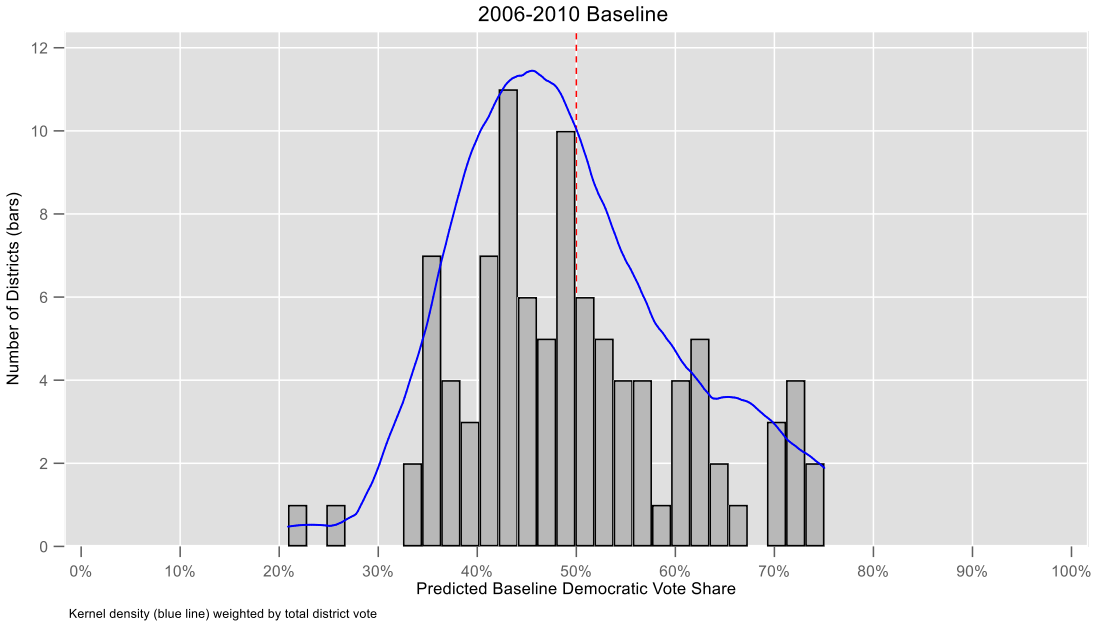
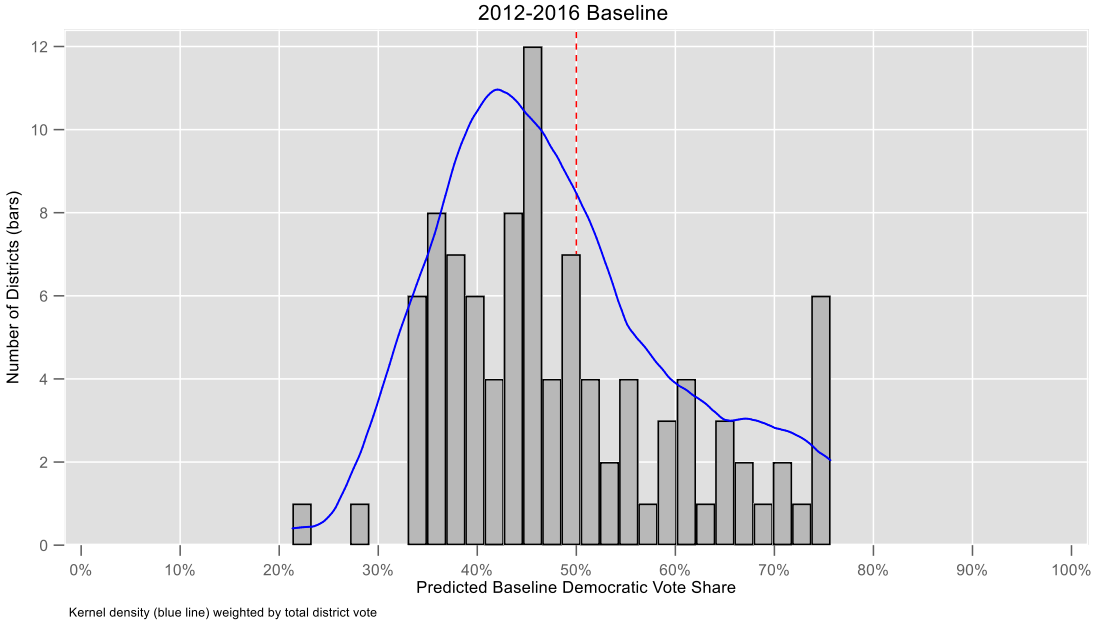


Figure 42
Distribution of Michigan Lower House Districts - Demonstration Plan
Excluding Majority Minority Districts



Similarly, the declination curves indicate less of a slope change on either side of 50% of the vote. The difference is observable, but is smaller than the comparable lines in the full statewide demonstration plan.

Figure 43
MI Lower House Declination - Demonstration Plan
Excluding Majority Minority Districts
2006-2010 Data

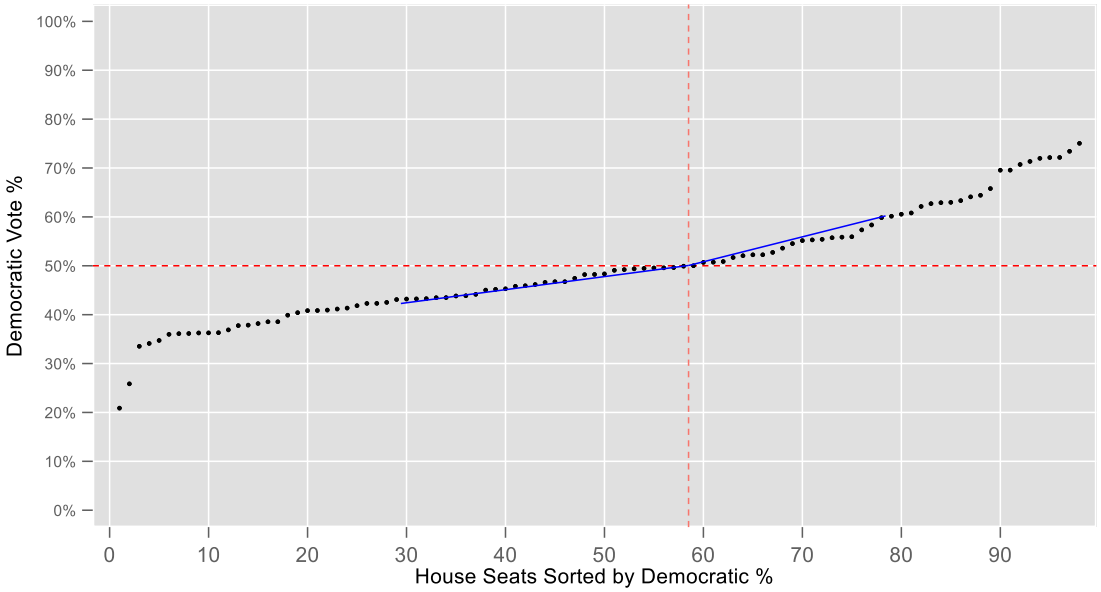
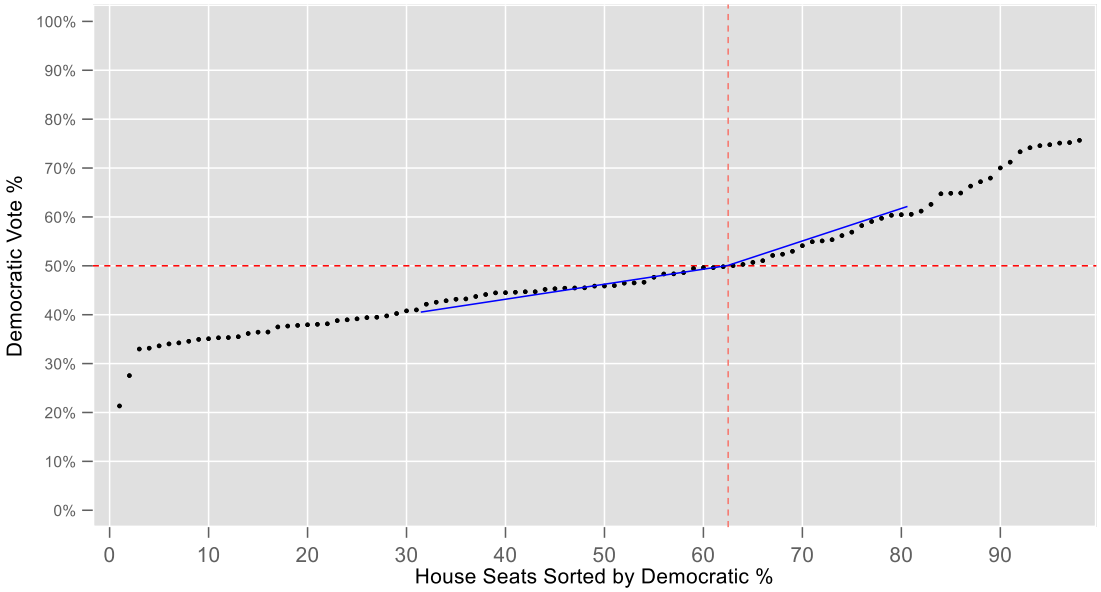


Figure 44
MI Lower House Declination - Demonstration Plan
Excluding Majority Minority Districts
2012-2016 Data



The demonstration plan for the state House shows some indications of residual bias and symmetry, but it is more balanced than the enacted map. Moreover, there are more districts in which Democratic voters constitute small majorities; this indicates less cracking and more competitive districts.

3. State Senate

The metrics for the demonstration state Senate map are shown in table 13.

Table 13
Michigan State Senate
Demonstration Plan Statewide Baseline

	2006-2010		2012-2016	
	Statewide	Excluding VRA (5)	Statewide	Excluding VRA (5)
Number of Districts	38	33	38	33
Democratic Share of Statewide Vote	53.2%	49.4%	52.3%	48.6%
Seats Won By Democrats	20	15	19	14
Democratic Share of Seats	52.6%	45.5%	50.0%	42.4%
Partisan Bias, actual	-0.5%	-3.9%	-2.3%	-6.1%
Partisan Bias at 50%	-7.9%	1.5%	-7.9%	-1.5%
Republican Seats won at Democratic Vote Share	26	16	25	14
Republican Share of Seats at Democratic Vote Share	68.4%	48.5%	65.8%	42.4%
Democratic Vote Share Needed to Win Majority of Seats	52.7%	49.5%	53.1%	50.5%
Efficiency Gap	-4.4%	-3.6%	-5.3%	-4.4%
Mean-Median	-2.4%	0.4%	-3.1%	-0.4%

Average Democratic Win %	62.8%	56.9%	63.5%	57.3%
Average Republican Win %	56.8%	56.8%	58.0%	58.0%
Declination	0.109	0.027	0.119	0.039

The demonstration map shows no significant indicators of gerrymandering. In 2006-2010, the map preserves majority seat status for the party receiving a majority of the statewide vote (the Democrats), while in 2012-2016 the map produces a tie 19-19 seat share at 52.3% Democratic vote share. Observed partisan bias is low (-0.5% and -3.9%), and the bias at 50% again reflects the number of competitive Democratic districts that flip as the a uniform swing changes the vote in each district by the amount necessary to obtain a split 50-50 aggregate vote share. The efficiency gap (-4.4% and -5.3) and declination (0.109 and 0.119) all point to a balanced map. The values of the mean-median (-2.4% and -3.1%) are not significant given the fact that the map does not have a counter-majoritarian result.

There is some evidence of asymmetry, as Republicans win more seats than the Democrats at the equivalent vote share, but the majoritarian status of the map is preserved.

Histogram and kernel density graphs show the balance of the demonstration Senate map. The peak of the density curve is close to 50% in both graphs and the distribution is more symmetrical.

Figure 45
Distribution of Michigan Senate Districts - Demonstration Plan

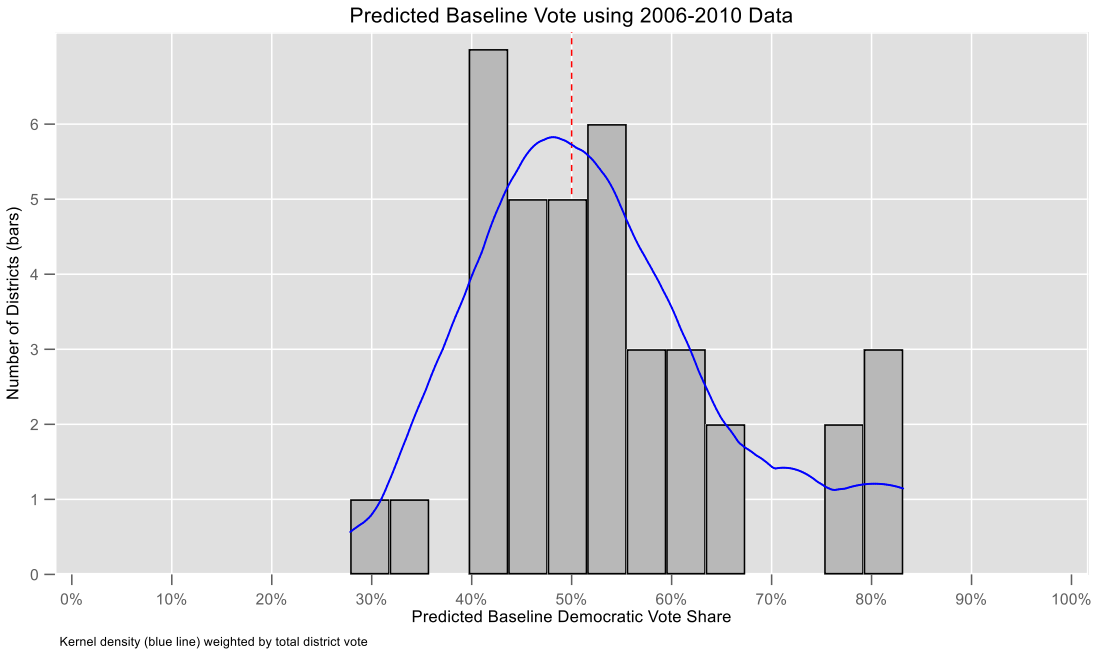
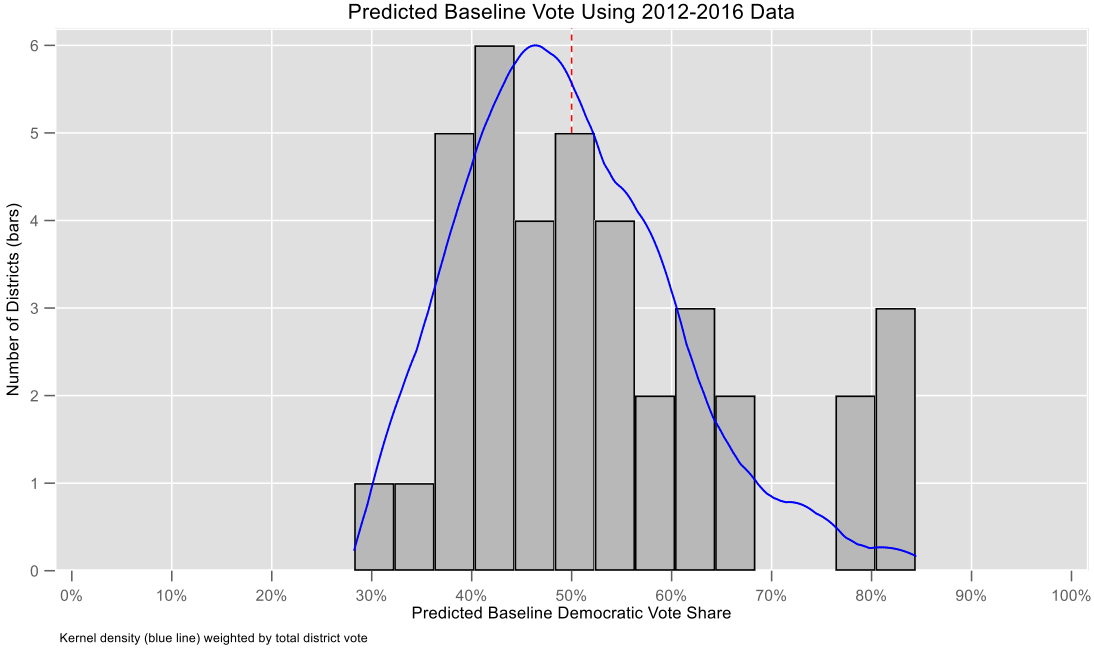


Figure 46
Distribution of Michigan Senate Districts - Demonstration Plan



The declination graphs, as well, show little evidence of significant change in the slope of the lines on either side of 50% of the vote:

Figure 47
MI State Senate Declination - Demonstration Plan
Predicted Baseline Vote Using 2006-2010 Data

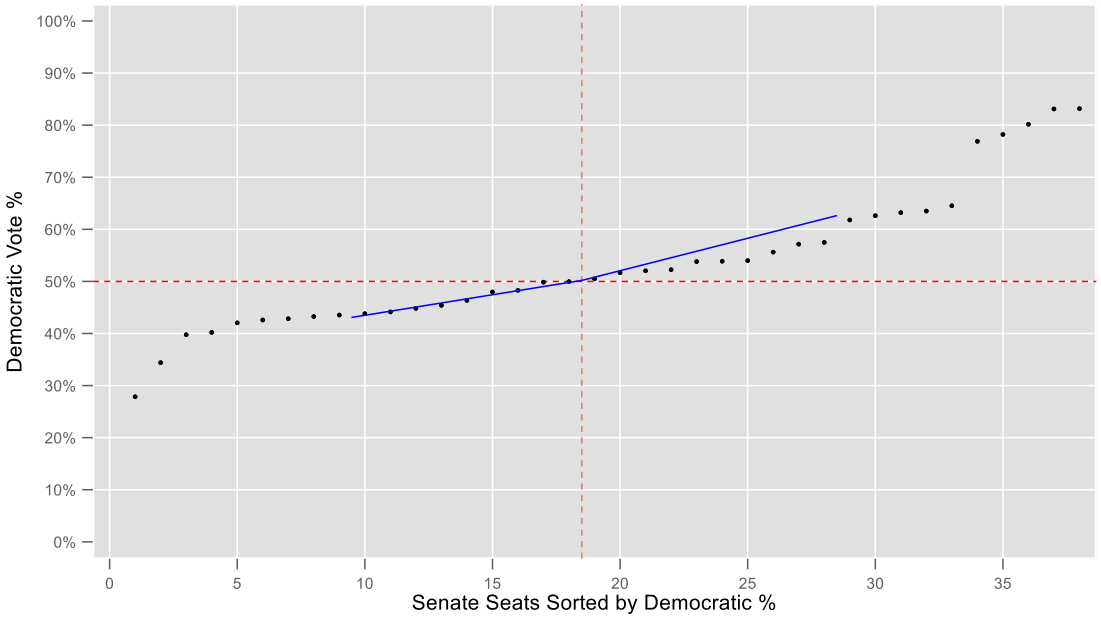
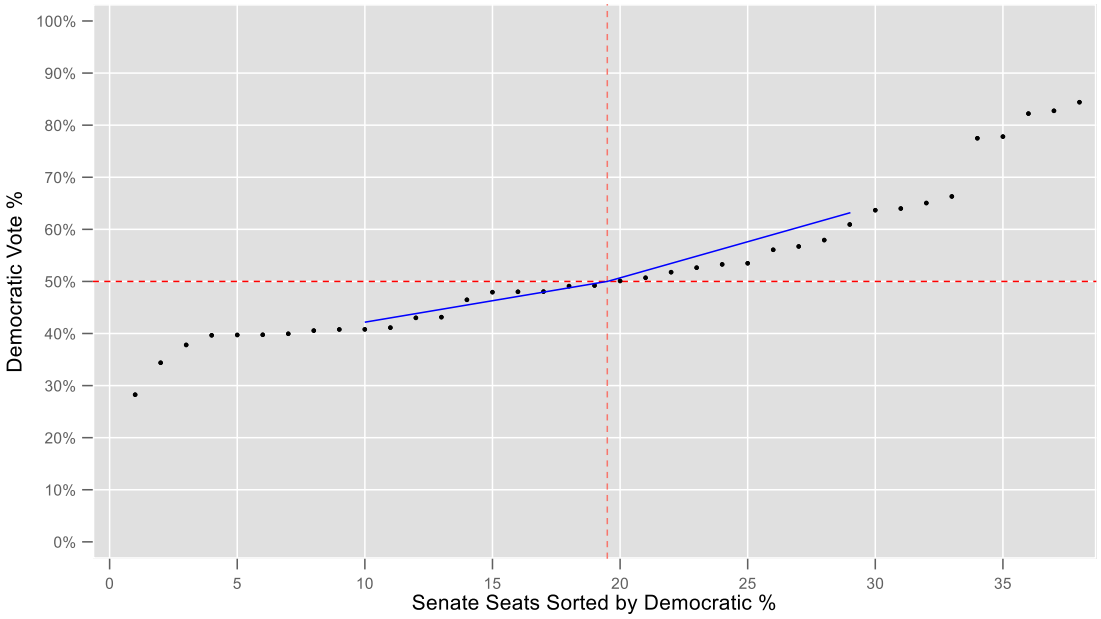


Figure 48
MI State Senate Declination - Demonstration Plan
Predicted Baseline Vote Using 2012-2016 Data



Moreover, any asymmetry that does arise disappears when majority-minority districts are excluded (columns 3 and 5 in table 13). Outside of the majority-minority districts, the demonstration plan is nearly symmetric, with virtually no bias at a 50-50 split with Republicans winning only one additional seat (16, compared to 15 Democratic seats) in 2006-2010 and perfect symmetry in the 2012-2016 data (both parties winning 14 seats at the equivalent vote percentage). The efficiency gap is low using both sets of data (-4.4% and -3.3%), and the declination (0.027 in 2006-2010, and 0.038 in 2012-2016) and mean-median (0.4% and -0.4%, respectively) are nearly zero.

The histogram/kernel density graphs and declination plots show the same pattern. The distributions are much closer to symmetric, with relatively equal numbers of Democratic and Republican districts on either side of 50%.

Figure 49
Distribution of Michigan State Senate Districts - Demonstration Plan
Excluding Majority-Minority Districts

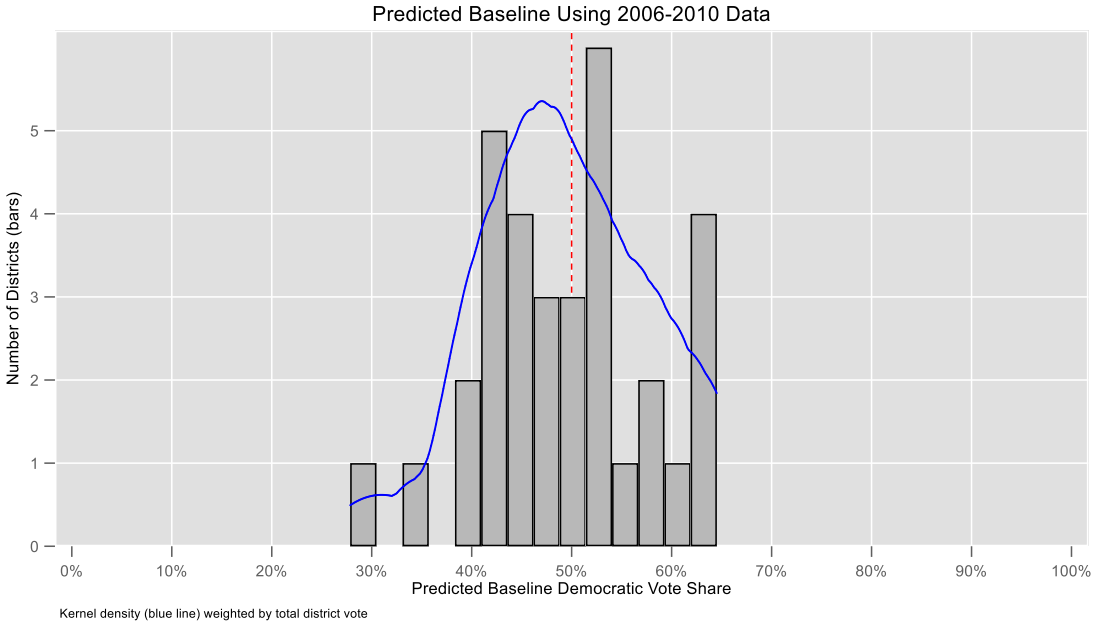
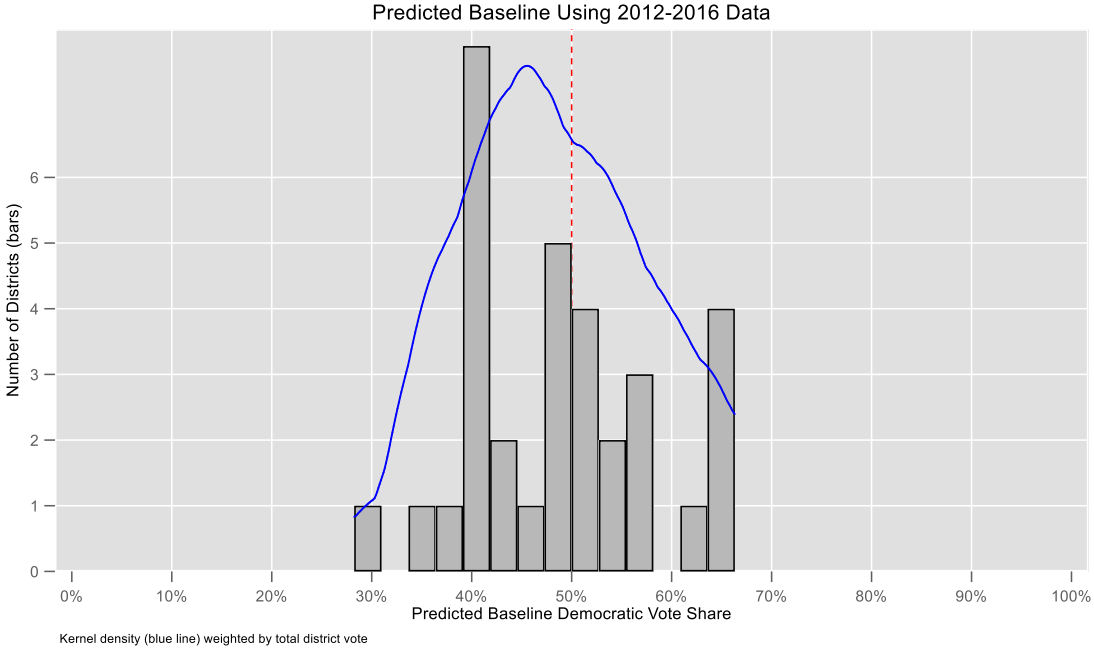


Figure 50
Distribution of Michigan State Senate Districts - Excluding Majority-Minority Districts



Similarly, the declination graphs show virtually no change in slope:

Figure 51
MI State Senate Declination - Demonstration Plan
Excluding Majority Minority Districts
2006-2010 Data

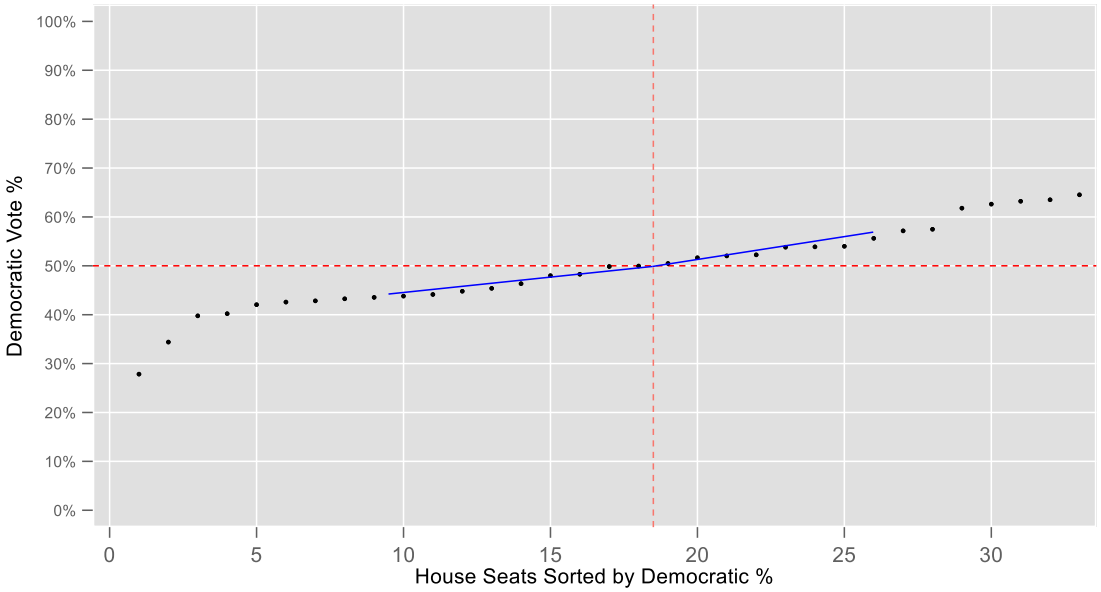
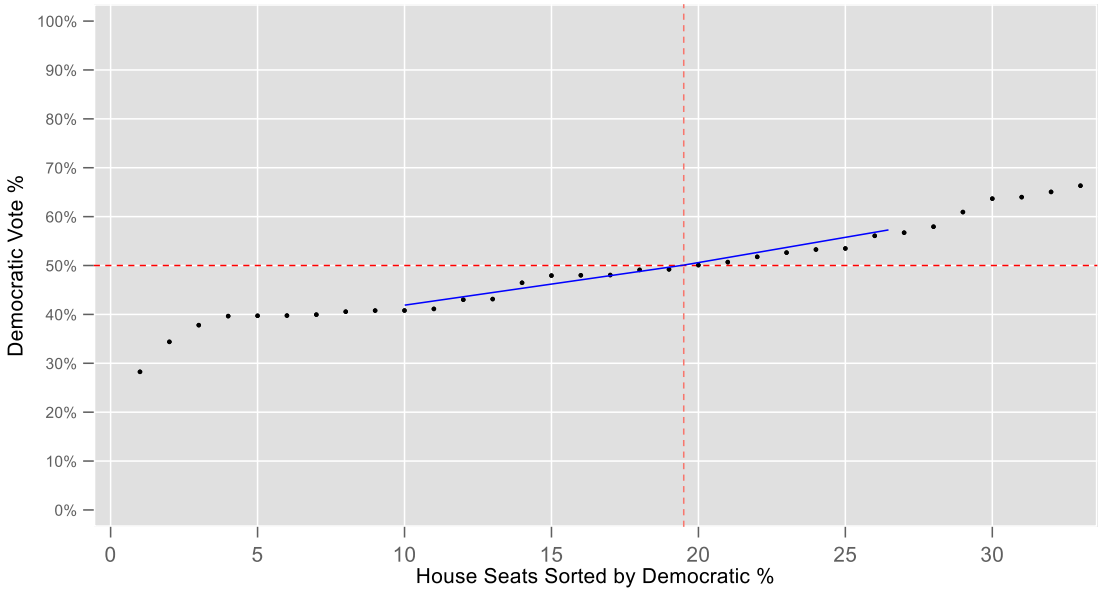


Figure 52
MI State Senate Declination - Excluding Majority-Minority Districts
Excluding Majority-Minority Districts
2012-2016 Data



4. Summary

The demonstration maps for U.S. House, state House, and state Senate are far more balanced than the enacted maps. Although there is some partisan imbalance in the state House maps, it is more symmetric and unbiased than the enacted maps. Moreover, nearly all of the metrics improve once the majority-minority districts are excluded from the analysis, indicating that in the demonstration maps the partisan imbalance is due to the existence of these districts.

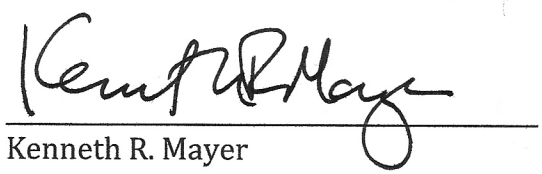
F. Conclusion

All three of the district plans – for the U.S. House, the Michigan State Senate, and Michigan House of Representatives – are extreme partisan gerrymanders. Among the metrics used to evaluate the partisan bias and asymmetry of a plan (observed bias, bias at 50-50, the vote totals needed to win a seat majority seat symmetry, the Efficiency Gap, the mean-median, and the declination), every one shows high values across all three maps. Visual

inspection of the distribution of district vote shares shows that this was achieved through the classic techniques of packing and cracking. Without exception in any of the plans, Democratic voters have been packed into districts where they constitute safe majorities, while they have been cracked in others to allow Republicans to win with comfortable but not overwhelming margins. These patterns are observed both prospectively, using data from 2006 to 2010 elections, and empirically, using data from 2012 to 2016. Over a ten year period and 6 electoral cycles, the asymmetry and bias have persisted.

The existence of majority-minority districts does not explain the extent of the observed bias and asymmetry. When these districts are excluded, the asymmetry and bias remain, indicating that even outside of these specific districts district lines create partisan advantage.

The demonstration maps are much more balanced, demonstrating that the partisan nature of the enacted maps was not necessary (the fact that they can be drawn using automated and neutral criteria, by itself, constitutes an "existence proof" of a neutral map and demonstrates that political geography does not explain the partisan character of the enacted maps). Nearly all of the metrics show less asymmetry and bias, and when observed are largely the consequence of majority-minority districts. Some measures are also a function of the high degree of competitiveness in the demonstration maps, with many districts very close to 50% of the vote baseline, such that very small changes in the vote can flip districts between the parties.



Kenneth R. Mayer

June 1, 2018

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Appendix – Baseline Vote Shares and Demographics of Enacted and Demonstration Plans

Table A1 – Enacted U.S. House Plan

Table A1 - Enacted United States House Districts					
US House District	Baseline Democratic Vote Share		Total Population	Voting Age Population	Black VAP Percent
	2006-2010	2012-2016			
1	47.1%	43.7%	705,974	562,564	1.5%
2	40.0%	39.1%	705,975	527,303	5.8%
3	42.9%	42.5%	705,974	524,761	8.3%
4	44.9%	42.3%	705,974	549,728	1.9%
5	61.9%	60.9%	705,975	535,254	16.3%
6	46.0%	44.8%	705,974	536,223	7.7%
7	47.0%	45.1%	705,974	539,015	4.1%
8	45.6%	45.3%	705,975	538,295	5.3%
9	55.5%	56.7%	705,975	555,079	8.7%
10	44.1%	40.7%	705,974	535,876	2.5%
11	43.6%	44.6%	705,974	537,217	4.8%
12	64.5%	65.8%	705,974	544,352	9.8%
13	84.4%	85.0%	705,974	525,825	55.7%
14	79.1%	80.3%	705,974	528,080	57.0%

Table A2 – Enacted Michigan Lower House Plan

Table A2 - Enacted MI Lower House Districts					
MI House District	Baseline Democratic Vote Share		Total Population	Voting Age Population	Black VAP Percent
	2006-2010	2012-2016			
1	73.3%	74.4%	87,768	62,294	60.7%
2	73.3%	74.2%	87,595	64,027	64.9%
3	96.4%	97.2%	87,906	63,943	90.4%
4	94.2%	94.7%	88,168	66,021	61.7%
5	95.3%	95.8%	87,356	61,356	62.1%
6	92.7%	93.4%	89,085	68,287	60.4%
7	96.8%	98.1%	88,586	66,954	95.5%
8	95.9%	97.0%	87,850	64,510	90.9%
9	94.6%	95.6%	89,598	62,867	76.0%
10	80.3%	84.5%	87,869	66,763	56.4%
11	69.0%	69.5%	92,223	69,301	23.7%
12	69.6%	69.1%	92,972	69,654	20.7%
13	58.4%	58.1%	91,612	71,322	3.9%
14	63.8%	62.8%	87,228	67,114	4.4%
15	60.6%	64.8%	89,880	63,766	4.1%
16	64.7%	65.8%	91,556	71,051	16.8%
17	56.6%	52.6%	88,062	66,255	4.2%
18	57.3%	59.1%	92,236	72,533	10.7%
19	45.0%	45.7%	92,330	73,243	3.3%
20	43.4%	45.6%	92,769	70,915	5.8%
21	53.5%	55.5%	92,256	67,398	12.6%
22	62.4%	63.2%	86,238	66,543	11.0%
23	52.1%	50.8%	93,261	71,031	4.1%
24	48.2%	47.4%	86,498	67,899	7.0%
25	51.4%	51.4%	85,781	67,504	5.6%
26	55.4%	56.9%	86,930	71,320	4.5%
27	72.1%	74.6%	91,794	71,168	23.4%
28	61.8%	64.0%	86,089	66,256	12.1%
29	73.8%	74.2%	87,992	66,002	38.1%
30	47.5%	46.0%	87,305	68,328	3.6%
31	57.3%	57.1%	88,557	69,488	13.1%
32	46.7%	42.5%	87,609	65,072	2.9%
33	43.9%	41.5%	86,511	62,405	4.6%
34	89.4%	91.1%	86,516	61,937	58.3%
35	78.9%	82.0%	90,361	71,146	58.5%
36	38.4%	35.7%	86,298	65,730	2.3%

37	54.5%	58.2%	90,112	70,658	15.9%
38	41.4%	43.2%	91,476	68,209	5.4%
39	46.8%	46.1%	91,796	68,537	6.8%
40	43.5%	45.1%	91,620	70,830	6.9%
41	43.3%	45.2%	92,805	71,375	3.5%
42	37.0%	35.9%	91,945	69,550	0.5%
43	41.4%	40.5%	93,564	71,141	3.1%
44	37.6%	36.3%	92,893	70,005	1.5%
45	39.3%	40.2%	88,371	67,195	4.1%
46	35.4%	34.5%	89,560	65,046	1.6%
47	35.1%	33.3%	89,022	65,180	0.3%
48	60.2%	57.7%	90,592	69,264	3.4%
49	70.0%	71.4%	86,581	66,041	25.0%
50	55.3%	55.8%	90,865	68,256	8.1%
51	45.8%	44.1%	94,324	71,338	1.3%
52	48.4%	50.2%	86,730	65,442	1.6%
53	76.8%	80.0%	85,792	74,718	6.8%
54	72.2%	74.8%	85,855	65,642	29.0%
55	63.6%	66.1%	86,414	67,036	10.1%
56	49.7%	45.5%	86,675	66,061	0.9%
57	46.5%	44.1%	94,159	72,314	2.8%
58	37.8%	33.0%	91,936	70,009	2.1%
59	42.4%	38.5%	93,735	70,206	4.1%
60	67.7%	70.7%	93,159	73,897	17.4%
61	45.2%	46.9%	93,158	70,793	5.4%
62	55.1%	53.3%	92,474	69,713	14.5%
63	44.0%	40.7%	92,009	69,992	2.7%
64	46.5%	44.6%	86,288	64,391	8.7%
65	45.6%	42.6%	93,828	73,681	5.5%
66	46.8%	44.4%	91,935	68,997	3.8%
67	51.6%	52.7%	93,656	71,185	6.5%
68	71.0%	74.0%	94,139	71,275	20.6%
69	60.1%	62.0%	93,100	79,836	5.2%
70	44.5%	40.7%	87,024	67,186	5.4%
71	49.4%	50.3%	93,624	72,089	6.8%
72	37.5%	39.6%	93,393	68,496	9.5%
73	35.0%	35.3%	93,827	68,017	1.1%
74	35.8%	35.1%	91,226	67,351	2.0%
75	71.5%	73.5%	93,802	67,909	24.5%
76	49.0%	52.8%	94,238	73,626	13.0%
77	36.3%	37.5%	92,442	67,584	5.4%

78	43.7%	39.0%	90,905	70,604	5.7%
79	44.5%	44.4%	85,761	64,786	19.6%
80	37.8%	36.0%	91,868	68,272	1.2%
81	44.3%	40.8%	85,596	65,798	0.8%
82	43.0%	38.8%	88,319	66,965	1.1%
83	45.8%	42.1%	88,414	67,120	3.2%
84	45.0%	39.4%	88,847	68,914	0.7%
85	49.2%	46.7%	93,124	70,826	0.4%
86	32.6%	32.4%	92,271	67,929	4.9%
87	38.8%	35.7%	94,041	70,433	0.3%
88	23.2%	23.2%	87,130	65,686	1.4%
89	34.1%	33.6%	85,375	63,814	0.6%
90	25.9%	27.5%	91,296	65,564	2.0%
91	51.5%	47.8%	86,460	65,176	1.8%
92	67.8%	66.0%	85,728	64,225	25.1%
93	43.6%	43.1%	94,176	70,994	1.7%
94	44.6%	43.3%	89,913	70,852	5.2%
95	74.0%	75.6%	87,780	65,239	35.3%
96	57.3%	54.9%	86,595	67,418	1.6%
97	47.8%	43.0%	85,628	67,510	0.3%
98	43.8%	41.6%	85,899	65,711	1.2%
99	49.8%	47.8%	89,217	72,141	2.0%
100	43.3%	38.0%	86,569	65,801	1.9%
101	46.6%	45.2%	92,671	73,797	1.2%
102	41.2%	38.3%	85,950	66,911	1.4%
103	44.3%	39.4%	92,224	73,595	0.2%
104	40.4%	40.8%	86,986	67,791	1.3%
105	40.7%	37.1%	92,098	72,498	0.2%
106	48.9%	43.6%	94,220	76,635	0.3%
107	44.2%	40.8%	94,062	74,414	3.6%
108	50.5%	44.2%	87,266	68,877	0.2%
109	57.7%	54.5%	87,465	71,278	3.3%
110	52.8%	47.8%	86,997	70,524	2.1%

Table A3 – Enacted Michigan Senate Plan

Table A2 - Enacted MI State Senate Districts					
MI House Senate	Baseline Democratic Vote Share		Total Population	Voting Age Population	Black VAP Percent
	2006-2010	2012-2016			
1	78.2%	77.8%	254,936	197,305	50.2%
2	76.9%	77.5%	254,991	181,640	56.3%
3	83.2%	84.4%	254,934	181,977	51.8%
4	83.1%	82.8%	255,038	190,813	50.7%
5	80.2%	82.2%	260,300	196,028	50.0%
6	64.5%	64.0%	267,785	202,934	16.2%
7	46.3%	48.1%	272,600	208,092	5.9%
8	46.3%	43.9%	270,685	210,428	5.1%
9	61.6%	63.6%	271,123	208,423	12.9%
10	48.8%	47.7%	271,486	208,065	5.4%
11	70.8%	73.7%	272,444	213,937	32.6%
12	46.1%	46.4%	255,847	190,531	15.5%
13	44.9%	46.6%	272,689	212,769	3.7%
14	45.9%	45.2%	248,755	188,197	3.9%
15	44.5%	44.7%	257,980	193,879	5.7%
16	43.3%	40.0%	252,184	193,062	5.7%
17	49.9%	46.5%	251,913	192,108	2.2%
18	69.1%	71.7%	272,524	218,426	14.2%
19	45.7%	42.6%	259,224	196,082	6.9%
20	52.2%	53.3%	250,331	193,405	9.6%
21	43.5%	40.8%	270,401	205,596	9.5%
22	40.2%	39.8%	253,234	189,142	0.8%
23	61.9%	63.9%	265,110	210,463	11.1%
24	47.1%	46.9%	269,574	204,850	3.1%
25	44.5%	40.5%	266,956	204,036	1.6%
26	40.2%	39.7%	261,519	193,618	5.0%
27	74.7%	74.4%	252,670	188,680	29.6%
28	35.4%	35.2%	257,950	189,302	2.9%
29	47.5%	50.0%	270,819	200,602	13.4%
30	27.8%	28.3%	263,801	195,064	1.4%
31	49.6%	45.5%	251,819	193,422	1.2%
32	54.3%	53.6%	267,936	204,803	13.4%
33	46.4%	43.7%	249,853	197,798	3.1%
34	53.8%	50.1%	247,218	185,728	9.6%
35	44.6%	41.4%	252,697	199,338	1.0%
36	45.6%	41.4%	247,592	195,791	0.5%

37	42.0%	40.0%	251,625	198,004	2.2%
38	53.9%	49.1%	255,097	205,234	1.6%

Table A4 – Demonstration Plan, U.S. House

Table A4 - Demonstration Plan, United States House Districts					
US House District	Baseline Democratic Vote Share		Total Population	Voting Age Population	Black VAP Percent
	2006-2010	2012-2016			
1	46.0%	42.9%	705,974	559,852	1.4%
2	41.4%	42.4%	705,975	522,870	8.3%
3	41.9%	40.1%	705,974	537,780	4.5%
4	45.6%	44.5%	705,975	535,476	7.7%
5	51.9%	52.0%	705,974	546,395	7.8%
6	54.2%	52.8%	705,974	529,219	11.7%
7	55.0%	55.4%	705,974	549,266	8.2%
8	55.7%	55.6%	705,974	531,154	6.0%
9	40.8%	41.0%	705,975	534,356	3.8%
10	48.3%	48.7%	705,974	547,952	5.3%
11	51.1%	49.7%	705,974	542,006	6.5%
12	50.1%	47.2%	705,975	549,341	5.4%
13	84.0%	84.8%	705,974	525,825	55.7%
14	78.9%	80.2%	705,974	528,080	57.0%

Table A5 – Demonstration Plan, Michigan Lower House

Table A5 – Demonstration Plan MI Lower House Districts					
MI House District	Baseline Democratic Vote Share		Total Population	Voting Age Population	Black VAP Percent
	2006-2010	2012-2016			
1	57.3%	59.1%	92,236	72,533	10.7%
2	49.9%	44.1%	88,126	71,371	0.2%
3	43.2%	39.0%	93,120	71,513	6.8%
4	60.8%	60.3%	92,412	71,032	8.3%
5	69.6%	71.2%	85,436	65,362	24.0%
6	59.8%	59.7%	88,304	68,498	10.3%
7	47.4%	44.5%	86,326	64,484	3.8%
8	36.3%	33.6%	89,194	66,448	1.7%
9	43.5%	44.7%	91,563	70,852	4.1%
10	71.3%	75.1%	86,095	68,953	5.5%
11	43.3%	38.0%	86,569	65,801	1.9%
12	49.1%	44.6%	93,024	70,989	1.1%
13	49.2%	47.7%	92,192	72,267	3.6%
14	50.7%	54.1%	90,173	65,602	9.6%
15	36.3%	37.5%	92,442	67,584	5.4%
16	50.9%	49.4%	93,900	71,983	12.8%
17	52.2%	49.8%	93,998	70,952	12.0%
18	45.0%	39.4%	88,847	68,914	0.7%
19	34.7%	33.2%	90,845	66,710	0.9%
20	64.4%	66.3%	94,325	80,372	7.7%
21	43.8%	42.2%	93,628	67,179	3.7%
22	55.4%	56.9%	86,930	71,320	4.5%
23	46.7%	44.5%	93,861	72,110	2.8%
24	73.4%	74.2%	90,251	68,761	32.0%
25	49.5%	50.0%	85,404	66,568	7.8%
26	62.7%	60.5%	86,129	65,102	16.3%
27	41.4%	43.2%	91,476	68,209	5.4%
28	52.7%	55.1%	93,892	72,659	10.4%
29	42.3%	40.2%	93,907	71,373	1.1%
30	70.7%	73.3%	86,944	73,074	10.0%
31	65.8%	67.9%	89,735	70,871	16.2%
32	63.0%	64.7%	92,348	69,534	27.0%
33	43.9%	45.3%	93,787	72,359	7.3%
34	45.3%	44.7%	93,869	72,345	4.6%
35	75.1%	75.7%	85,907	64,433	38.9%
36	44.2%	42.8%	85,647	65,556	3.6%

37	38.5%	36.2%	93,595	71,642	2.2%
38	40.4%	40.8%	86,986	67,791	1.3%
39	38.5%	34.9%	88,317	67,896	0.2%
40	46.7%	42.6%	89,161	71,653	3.7%
41	62.9%	67.2%	94,148	68,876	27.1%
42	37.9%	34.6%	93,528	68,385	0.4%
43	38.2%	36.4%	88,045	66,735	1.0%
44	42.3%	38.1%	92,973	71,392	0.4%
45	89.6%	90.1%	85,510	60,978	60.3%
46	54.5%	58.2%	90,112	70,658	15.9%
47	36.9%	39.8%	86,185	63,460	10.4%
48	46.2%	46.0%	85,964	65,513	19.5%
49	69.6%	70.0%	93,587	69,966	25.4%
50	36.0%	34.2%	90,492	67,547	0.3%
51	45.9%	45.4%	92,004	68,832	6.4%
52	40.9%	37.7%	91,377	68,872	0.4%
53	43.1%	39.5%	91,422	70,161	3.3%
54	55.9%	53.0%	91,070	68,717	3.2%
55	36.3%	35.1%	90,475	67,183	0.5%
56	72.2%	74.8%	85,855	65,642	29.0%
57	50.7%	48.6%	90,959	74,537	2.0%
58	41.8%	38.8%	93,164	73,010	3.1%
59	58.4%	55.3%	93,474	72,351	1.5%
60	20.9%	21.3%	85,775	64,629	1.6%
61	34.1%	34.0%	90,348	66,533	2.1%
62	48.3%	49.6%	92,731	70,489	2.8%
63	72.1%	74.6%	91,794	71,168	23.4%
64	40.8%	37.8%	92,572	72,290	0.3%
65	39.9%	41.0%	85,535	65,088	4.2%
66	49.6%	46.5%	89,406	67,772	3.8%
67	40.8%	36.5%	91,317	68,570	2.9%
68	25.9%	27.5%	91,296	65,564	2.0%
69	55.2%	49.6%	90,076	71,827	1.2%
70	55.9%	52.4%	86,059	64,299	10.5%
71	52.1%	45.9%	85,815	68,517	2.1%
72	41.2%	39.2%	87,894	66,014	4.7%
73	33.5%	35.3%	88,583	63,989	1.4%
74	72.0%	75.2%	93,839	71,435	21.3%
75	37.8%	33.0%	91,936	70,009	2.1%
76	43.2%	43.7%	85,687	63,806	3.0%
77	43.5%	45.5%	90,976	69,963	3.5%

78	45.8%	46.5%	85,897	65,169	2.8%
79	49.6%	48.3%	90,011	68,650	1.3%
80	46.6%	45.2%	92,671	73,797	1.2%
81	49.4%	46.6%	87,183	66,173	0.5%
82	48.2%	45.5%	90,522	68,380	6.2%
83	36.1%	35.5%	86,132	63,016	1.9%
84	42.5%	37.9%	85,895	65,217	0.3%
85	55.7%	56.2%	92,514	73,246	7.6%
86	52.3%	50.7%	92,872	71,064	3.8%
87	36.2%	35.3%	86,730	64,871	0.5%
88	55.3%	54.9%	86,585	68,836	12.5%
89	51.7%	52.1%	87,255	65,069	6.4%
90	50.0%	48.4%	92,962	72,968	10.9%
91	48.2%	43.2%	88,754	71,937	0.2%
92	63.3%	61.2%	90,199	68,862	5.2%
93	64.1%	62.6%	94,074	72,963	4.2%
94	49.6%	50.3%	92,629	71,595	6.8%
95	60.1%	60.5%	85,466	64,845	5.8%
96	53.6%	51.0%	85,837	70,335	2.5%
97	45.2%	45.9%	92,483	73,208	3.3%
98	62.1%	64.9%	92,063	70,005	13.3%
99	73.3%	74.4%	87,768	62,294	60.7%
100	73.3%	74.2%	87,595	64,027	64.9%
101	96.4%	97.2%	87,906	63,943	90.4%
102	94.2%	94.7%	88,171	66,024	61.7%
103	95.3%	95.8%	87,356	61,356	62.1%
104	92.7%	93.4%	89,082	68,284	60.4%
105	96.8%	98.1%	88,524	66,908	95.5%
106	95.9%	97.0%	88,195	64,767	91.0%
107	94.6%	95.6%	89,598	62,867	76.0%
108	80.2%	84.4%	87,586	66,552	56.2%
109	60.6%	64.8%	89,880	63,766	4.1%
110	78.9%	82.0%	90,361	71,146	58.5%

Table A6 – Demonstration Plan, Michigan Senate

Table A6 - Demonstration Plan, MI State Senate Districts					
MI House Senate	Baseline Democratic Vote Share		Total Population	Voting Age Population	Black VAP Percent
	2006-2010	2012-2016			
1	77.8%	77.6%	254,936	197,305	50.2%
2	76.7%	77.3%	254,991	181,640	56.3%
3	82.8%	84.2%	254,934	181,977	51.8%
4	82.7%	82.5%	255,038	190,813	50.7%
5	79.7%	82.0%	260,300	196,028	50.0%
6	64.0%	63.8%	267,785	202,934	16.2%
7	46.3%	48.0%	272,600	208,092	5.9%
8	51.8%	47.9%	251,647	200,746	0.7%
9	53.8%	49.0%	255,097	205,234	1.6%
10	40.3%	39.8%	261,519	193,618	5.0%
11	43.8%	40.0%	267,335	211,570	1.7%
12	42.1%	40.0%	261,802	197,766	2.9%
13	42.6%	41.4%	262,308	204,787	1.4%
14	43.7%	40.9%	270,401	205,596	9.5%
15	43.2%	40.1%	252,184	193,062	5.7%
16	49.8%	49.3%	272,940	207,382	7.9%
17	56.9%	56.7%	256,829	194,191	9.7%
18	63.2%	60.9%	268,642	200,593	21.5%
19	45.4%	43.3%	264,906	209,596	2.6%
20	44.7%	41.0%	272,047	207,874	2.2%
21	61.7%	63.7%	251,860	200,709	11.2%
22	52.2%	53.3%	250,331	193,405	9.6%
23	48.2%	50.7%	272,825	202,506	13.3%
24	34.5%	34.5%	255,944	187,398	2.9%
25	49.6%	46.5%	251,913	192,108	2.2%
26	39.8%	38.0%	251,615	188,319	0.4%
27	42.8%	40.6%	269,066	201,598	3.4%
28	55.3%	55.9%	272,012	211,613	8.2%
29	57.1%	57.7%	267,125	209,867	11.2%
30	53.6%	50.1%	247,218	185,728	9.6%
31	47.8%	48.0%	248,373	185,241	15.6%
32	63.0%	66.2%	265,832	207,444	32.5%
33	51.6%	53.5%	251,212	198,327	5.2%
34	44.1%	43.1%	264,687	200,655	4.3%

35	50.4%	51.7%	252,378	189,981	12.8%
36	28.1%	28.5%	263,801	195,064	1.4%
37	53.8%	52.6%	255,898	195,966	13.9%
38	62.6%	65.0%	253,309	202,839	6.3%

Appendix B – Curriculum Vitae

Kenneth R. Mayer

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Education

Yale University, Department of Political Science, Ph.D., 1988.
Yale University, Department of Political Science, M.A., M.Phil.,1987.
University of California, San Diego, Department of Political Science, B.A., 1982.

Positions Held

University of Wisconsin, Madison. Department of Political Science.
- Professor, July 2000-present.
- Associate Professor, June 1996-June 2000.
- Assistant Professor, August 1989-May 1996.

Fulbright-ANU Distinguished Chair in Political Science, Australian National University (Canberra, ACT), July-December 2006.

Director, Data and Computation Center, College of Letters and Science, University of Wisconsin-Madison, June 1996-September 2003

Consultant, The RAND Corporation, Washington DC, 1988-1994. Conducted study of acquisition reform, and the effects of acquisition policy on the defense industrial base. Performed computer simulations of U.S. strategic force posture and capabilities.

Contract Specialist, Naval Air Systems Command, Washington D.C., 1985-1986. Responsible for cost and price analysis, contract negotiation, and contract administration for aerial target missile programs in the $5 million - $100 million range.

Honors and Awards

American Political Science Association, State Politics and Policy Section. Award for best Journal Article Published in the *American Journal of Political Science* in 2014. Awarded for Burden, Canon, Mayer, and Moynihan, "Election Laws, Mobilization, and Turnout."

Robert H. Durr Award, from the Midwest Political Science Association, for Best Paper Applying Quantitative Methods to a Substantive Problem Presented at the 2013 Meeting. Awarded for Burden, Canon, Mayer, and Moynihan, "Election Laws and Partisan Gains."

Leon Epstein Faculty Fellow, College of Letters and Science, 2012-2015

UW Housing Honored Instructor Award, 2012, 2014, 2017

Recipient, Jerry J. and Mary M. Cotter Award, College of Letters and Science, 2011-2012

Alliant Underkofler Excellence in Teaching Award, University of Wisconsin System, 2006

Pi Sigma Alpha Teaching Award, Fall 2006

Vilas Associate, 2003-2004, University of Wisconsin-Madison Graduate School.

2002 Neustadt Award. Awarded by the Presidency Research Group of the American Political Science Association, for the best book published on the American presidency in 2001. Awarded for *With the Stroke of a Pen: Executive Orders and Presidential Power*.

Lilly Teaching Fellow, University of Wisconsin-Madison, 1993-1994.
Interfraternity Council award for Outstanding Teaching, University of Wisconsin-Madison, 1993.
Selected as one of the 100 best professors at University of Wisconsin-Madison, Wisconsin Student Association, March 1992.
Olin Dissertation Fellow, Center for International Affairs, Harvard University, 1987-1988

Service as Expert Witness

One Wisconsin Institute, Inc., et al. v. Nichol, et al., No. 3:15- CV-324 (W.D. Wis.), voting rights (2016).
Whitford et al. v. Gill et al., No. 15-CV-421-bbc (W.D. Wis.), redistricting (2016).
Milwaukee NAACP et al. v. Scott Walker et. al, No. 11-CV-5492 (Dane County Circuit Court), photo-ID (2012).
Baldus et al. v. Brennan et al., No. 11-CV-562 (E.D. Wis.), redistricting (2012).
County of Kenosha v. City of Kenosha, No. 22-CV-1813 *(*Kenosha County Circuit Court), municipal redistricting , (2011).
McComish et al. v Brewer et al.. No. 02-CV-1550 (D. Ariz), campaign finance (2009).
Baumgart et al. v. Wendelberger et al. No 01-CV-121 (E.D. Wis.), redistricting (2002).

Grants and Research

"Analyzing Nonvoting and the Student Voting Experience in Wisconsin." Dane County (WI) Clerk, $44,157. November 2016-December 2017. Additional support ($30,000) provided by the Office of the Chancellor, UW-Madison.
Campaign Finance Task Force, Stanford University and New York University, $36,585. September 2016-August 2017.
Participant and Board Member, 2016 White House Transition Project, PIs Martha Joynt Kumar (Towson State University) and Terry Sullivan (University of North Carolina-Chapel Hill).
"How do You Know? The Structure of Presidential Advising and Error Correction in the White House." Graduate School Research Committee, University of Wisconsin, $18,941. July 1, 2015-June 30,2016.
"Study and Recommendations for the Government Accountability Board Chief Inspectors' Statements and Election Incident Report Logs." $43,234. Co-PI. With Barry C. Burden (PI), David T. Canon (co-PI), and Donald Moynihan (co-PI). October 2011-May 2012.
"Public Funding in Connecticut Legislative Elections." Open Society Institute. September 2009- December 2010. $55,000.
"Early Voting and Same Day Registration in Wisconsin and Beyond." Co-PI. October 2008- September 2009. Pew Charitable Trusts. $49,400. With Barry C. Burden (PI), David T. Canon (Co-PI), Kevin J. Kennedy (Co-PI), and Donald P. Moynihan (Co-PI).
City of Madison, Blue Ribbon Commission on Clean Elections. Joyce Foundation, Chicago, IL. $16,188. January-July 2008.
"Wisconsin Campaign Finance Project: Public Funding in Connecticut State Legislative Elections." JEHT Foundation, New York, NY. $84,735. November 2006-November 2007.
"Does Public Election Funding Change Public Policy? Evaluating the State of Knowledge." JEHT Foundation, New York, NY. $42,291. October 2005-April 2006.
"Wisconsin Campaign Finance Project: Disseminating Data to the Academic, Reform,

and Policy Communities." Joyce Foundation, Chicago, IL. $20,900. September 2005- August 2006.

"Enhancing Electoral Competition: Do Public Funding Programs for State and Local Elections Work?" Smith Richardson Foundation, Westport, CT. $129,611. December 2002-June 2005

WebWorks Grant (implementation of web-based instructional technologies), Division of Information Technology, UW-Madison, $1,000. November 1999.

"Issue Advocacy in Wisconsin during the 1998 Election." Joyce Foundation, Chicago, IL. $15,499. April 1999.

Instructional Technology in the Multimedia Environment (IN-TIME) grant, Learning Support Services, University of Wisconsin. $5,000. March 1997.

"Public Financing and Electoral Competitiveness in the Minnesota State Legislature." Citizens' Research Foundation, Los Angeles, CA, $2,000. May-November 1996.

"The Reach of Presidential Power: Policy Making Through Executive Orders." Graduate School Research Committee, University of Wisconsin, $21,965. July 1, 1995-August 31,1995. National Science Foundation (SBR-9511444), $60,004. September 1, 1995-August 31, 1998. Additional support provided by the Gerald R. Ford Library Foundation, the Eisenhower World Affairs Institute, and the Harry S. Truman Library Foundation.

"The Future of the Combat Aircraft Industrial Base." Changing Security Environment Project, John M. Olin Institute for Strategic Studies, Harvard University (with Ethan B. Kapstein). June 1993-January 1995. $15,000.

Hilldale Student Faculty Research Grant, College of Letters and Sciences, University of Wisconsin (with John M. Wood). 1992. Amount: $1,000 ($3,000 award to student)

"Electoral Cycles in Federal Government Prime Contract Awards" March 1992 – February 1995. National Science Foundation (SES-9121931), the Graduate School Research Committee at the University of Wisconsin, and the MacArthur Foundation. Amounts: National Science Foundation, $74,216; Graduate School Research Committee: $2,600; MacArthur Foundation, $2,500

C-SPAN In the Classroom Faculty Development Grant, 1991. $500

Professional and Public Service

Education and Social and Behavioral Sciences Institutional Review Board, 2008-2014. Acting Chair, Summer 2011. Chair, May 2012- June 2014.

Participant, U.S. Public Speaker Grant Program. United States Department of State (nationwide speaking tour in Australia, May 11-June 2, 2012).

Expert Consultant, Voces de la Frontera. Milwaukee Aldermanic redistricting, (2011).

Expert Consultant, Prosser for Supreme Court. Wisconsin Supreme Court election recount (2011).

Chair, Blue Ribbon Commission on Clean Elections (Madison), August 2007-April 2011.

Consultant, Consulate of the Government of Japan (Chicago) on state politics in Illinois, Indiana, Minnesota, and Wisconsin, 2006-2011.

Section head, Presidency Studies, 2006 Annual Meeting of the American Political Science Association.

Co-Chair, Committee on Redistricting, Supreme Court of Wisconsin, November 2003-December 2009.

Section Head, Presidency and Executive Politics, 2004 Annual Meeting of the Midwest Political Science Association, Chicago, IL.

Presidency Research Group (organized section of the American Political Science Association) Board, September 2002-present.
Book Review Editor, *Congress and the Presidency*, 2001-2006.
Editorial Board, *American Political Science Review*, September 2004- September 2007.
Consultant, Governor's Blue Ribbon Commission on Campaign Finance Reform. State of Wisconsin. 1997.

PUBLICATIONS

Books

Presidential Leadership: Politics and Policymaking, 10th edition. Lanham, MD: Rowman and Littlefield, 2018. With George C. Edwards, III, and Stephen J. Wayne.

The 2016 Presidential Elections: The Causes and Consequences of an Electoral Earthquake. Lanham, MD: Lexington Press, 2017. Co-edited with Amnon Cavari and Richard J. Powell.

The Enduring Debate: Classic and Contemporary Readings in American Government. 8th ed. New York: W.W. Norton & Co. 2017. Co-edited with David T. Canon and John Coleman. Previous editions 1st (1997), 2nd (2000), 3rd (2002), 4th (2006), 5th (2009), 6th (2011), 7th (2013).

Faultlines: Readings in American Government, 5th ed. New York: W.W. Norton & Co. 2017. Co-edited with David T. Canon and John Coleman. Previous editions 1st (2004), 2nd (2007), 3rd (2011), 4th (2013).

The 2012 Presidential Election: Forecasts, Outcomes, and Consequences. Lanham, MD: Rowman and Littlefield, 2014. Co-edited with Amnon Cavari and Richard J. Powell.

Readings in American Government, 7th edition. New York: W.W. Norton & Co. 2002. Co-edited with Theodore J. Lowi, Benjamin Ginsberg, David T. Canon, and John Coleman). Previous editions 4th (1996), 5th (1998), 6th (2000).

With the Stroke of a Pen: Executive Orders and Presidential Power. Princeton, NJ: Princeton University Press. 2001.

- Winner of the 2002 Neustadt Award from the Presidency Studies Group of the American Political Science Association, for the Best Book on the Presidency Published in 2001.

The Dysfunctional Congress? The Individual Roots of an Institutional Dilemma. Boulder, CO: Westview Press. 1999. With David T. Canon.

The Political Economy of Defense Contracting. New Haven: Yale University Press. 1991.

Monographs

2008 Election Data Collection Grant Program: Wisconsin Evaluation Report. Report to the Wisconsin Government Accountability Board, September 2009. With Barry C. Burden, David T. Canon, Stéphane Lavertu, and Donald P. Moynihan.

Issue Advocacy in Wisconsin: Analysis of the 1998 Elections and A Proposal for Enhanced Disclosure. September 1999.

Public Financing and Electoral Competition in Minnesota and Wisconsin. Citizens' Research Foundation, April 1998 .

Campaign Finance Reform in the States. Report prepared for the Governor's Blue Ribbon Commission on Campaign Finance Reform (State of Wisconsin). February 1998. Portions reprinted in Anthony Corrado, Thomas E. Mann, Daniel Ortiz, Trevor Potter, and Frank J. Sorauf, ed., *Campaign Finance*

Reform: A Sourcebook. Washington, D.C.: Brookings Institution, 1997.

"Does Public Financing of Campaigns Work?" *Trends in Campaign Financing*. Occasional Paper Series, Citizens' Research Foundation, Los Angeles, CA. 1996. With John M. Wood.

The Development of the Advanced Medium Range Air-to-Air Missile: A Case Study of Risk and Reward in Weapon System Acquisition. N-3620-AF. Santa Monica: RAND Corporation. 1993.

Barriers to Managing Risk in Large Scale Weapons System Development Programs. N-4624-AF. Santa Monica: RAND Corporation. 1993. With Thomas K. Glennan, Jr., Susan J. Bodilly, Frank Camm, and Timothy J. Webb.

Articles

"Learning from Recounts." *Election Law Journal* (forthcoming 2018). With Stephen Ansolabehere, Barry C. Burden, and Charles Stewart III.

"The Complicated Partisan Effects of State Election Laws." *Political Research Quarterly* 70:549-563 (No. 3, September 2017). With Barry C. Burden, David T. Canon, and Donald P. Moynihan.

"What Happens at the Polling Place: Using Administrative Data to Look Inside Elections." *Public Administration Review* 77:354-364 (No. 3, May/June 2017). With Barry C. Burden, David T. Canon, Donald P. Moynihan, and Jacob R. Neiheisel.

"Alien Abduction, and Voter Impersonation in the 2012 U.S. General Election Evidence from a Survey List Experiment." *Election Law Journal* 13:460-475 No.4, December 2014). With John S. Ahlquist and Simon Jackman.

"Election Laws, Mobilization, and Turnout: The Unanticipated Consequences of Election Reform." *American Journal of Political Science,* 58:95-109 (No. 1, January 2014). With Barry C. Burden, David T. Canon, and Donald P. Moynihan. Winner of the State Politics and Politics Section of the American Political Science Association Award for the best article published in the *AJPS* in 2014.

"Executive Power in the Obama Administration and the Decision to Seek Congressional Authorization for a Military Attack Against Syria: Implications for Theories of Unilateral Action." *Utah Law Review* 2014:821-841 (No. 4).

"Public Election Funding: An Assessment of What We Would Like to Know." *The Forum* 11:365-485 (No. 3, 2013).

"Selection Method, Partisanship, and the Administration of Elections." *American Politics Research* 41:903-936 (No. 6, November 2013). With Barry C. Burden, David T. Canon, Stéphane Lavertu, and Donald Moynihan.

"The Effect of Administrative Burden on Bureaucratic Perception of Policies: Evidence from Election Administration." *Public Administration Review* 72:741-451 (No. 5, September/October 2012). With Barry C. Burden, David T. Canon, and Donald Moynihan.

"Early Voting and Election Day Registration in the Trenches: Local Officials' Perceptions of Election Reform." *Election Law Journal* 10:89-102 (No. 2, 2011). With Barry C. Burden, David T. Canon, and Donald Moynihan.

"Is Political Science Relevant? Ask an Expert Witness," *The Forum*: Vol. 8, No. 3, Article 6 (2010).

"Thoughts on the Revolution in Presidency Studies," *Presidential Studies Quarterly* 39 (no. 4, December 2009).

"Does Australia Have a Constitution? Part I – Powers: A Constitution Without Constitutionalism." *UCLA Pacific Basin Law Journal* 25:228-264 (No. 2, Spring 2008). With Howard Schweber.

"Does Australia Have a Constitution? Part II: The Rights Constitution." *UCLA Pacific Basin Law Journal* 25:265-355 (No. 2, Spring 2008). With Howard Schweber.

"Public Election Funding, Competition, and Candidate Gender." *PS: Political Science and Politics* XL:661-667 (No. 4,October 2007). With Timothy Werner.

"Do Public Funding Programs Enhance Electoral Competition?" In Michael P. McDonald and John Samples, eds., *The Marketplace of Democracy: Electoral Competition and American Politics* (Washington, DC: Brookings Institution Press, 2006). With Timothy Werner and Amanda Williams. Excerpted in Daniel H. Lowenstein, Richard L. Hasen, and Daniel P. Tokaji, *Election Law: Cases and Materials*. Durham, NC: Carolina Academic Press, 2008.

"The Last 100 Days." *Presidential Studies Quarterly* 35:533-553 (No. 3, September 2005). With William Howell.

"Political Reality and Unforeseen Consequences: Why Campaign Finance Reform is Too Important To Be Left To The Lawyers," *University of Richmond Law Review* 37:1069-1110 (No. 4, May 2003).

"Unilateral Presidential Powers: Significant Executive Orders, 1949-1999." *Presidential Studies Quarterly* 32:367-386 (No. 2, June 2002). With Kevin Price.

"Answering Ayres: Requiring Campaign Contributors to Remain Anonymous Would Not Resolve Corruption Concerns." *Regulation* 24:24-29 (No. 4, Winter 2001).

"Student Attitudes Toward Instructional Technology in the Large Introductory US Government Course." *PS: Political Science and Politics* 33:597-604 (No. 3 September 2000). With John Coleman.

"The Institutionalization of Power." In Robert Y. Shapiro, Martha Joynt Kumar, and Lawrence R. Jacobs, eds. *Presidential Power: Forging the Presidency for the 21st Century*. New York: Columbia University Press, 2000. With Thomas J. Weko.

"The Limits of Delegation – the Rise and Fall of BRAC." *Regulation* 22:32-38 (No. 3, October 1999).

"Executive Orders and Presidential Power." *The Journal of Politics* 61:445-466 (No.2, May 1999).

"Bringing Politics Back In: Defense Policy and the Theoretical Study of Institutions and Processes." *Public Administration Review* 56:180-190 (1996). With Anne Khademian.

"Closing Military Bases (Finally): Solving Collective Dilemmas Through Delegation." *Legislative Studies Quarterly*, 20:393-414 (No. 3, August 1995).

"Electoral Cycles in Federal Government Prime Contract Awards: State-Level Evidence from the 1988 and 1992 Presidential Elections." *American Journal of Political Science* 40:162-185 (No. 1, February 1995).

"The Impact of Public Financing on Electoral Competitiveness: Evidence from Wisconsin, 1964-1990." *Legislative Studies Quarterly* 20:69-88 (No. 1, February 1995). With John M. Wood.

"Policy Disputes as a Source of Administrative Controls: Congressional Micromanagement of the Department of Defense." *Public Administration Review* 53:293-302 (No. 4, July-August 1993).

"Combat Aircraft Production in the United States, 1950-2000: Maintaining Industry Capability in an Era of Shrinking Budgets." *Defense Analysis* 9:159-169 (No. 2, 1993).

Book Chapters

"Is President Trump Conventionally Disruptive, or Unconventionally Destructive?" In *The 2016 Presidential Elections: The Causes and Consequences of an Electoral Earthquake*. Lanham, MD: Lexington Press, 2017. Co-edited with Amon Cavari and Richard J. Powell.

"Lessons of Defeat: Republican Party Responses to the 2012 Presidential Election. In Amnon Cavari, Richard J. Powell, and Kenneth R. Mayer, eds. *The 2012 Presidential Election: Forecasts, Outcomes, and Consequences*. Lanham, MD: Rowman and Littlefield. 2014.

"Unilateral Action." George C. Edwards, III, and William G. Howell, *Oxford Handbook of the American Presidency* (New York: Oxford University Press, 2009).

"Executive Orders," in Joseph Bessette and Jeffrey Tulis, *The Constitutional Presidency*. Baltimore: Johns Hopkins University Press, 2009.

"Hey, Wait a Minute: The Assumptions Behind the Case for Campaign Finance Reform." In Gerald C. Lubenow, ed., *A User's Guide to Campaign Finance Reform.* Lanham, MD: Rowman & Littlefield, 2001.

"Everything You Thought You Knew About Impeachment Was Wrong." In Leonard V. Kaplan and Beverly I. Moran, ed., *Aftermath: The Clinton Impeachment and the Presidency in the Age of Political Spectacle.* New York: New York University Press. 2001. With David T. Canon.

"Congressional-DoD Relations After the Cold War: The Politics of Uncertainty." In *Downsizing Defense*, Ethan Kapstein ed. Washington DC: Congressional Quarterly Press. 1993.

"Elections, Business Cycles, and the Timing of Defense Contract Awards in the United States." In Alex Mintz, ed. *The Political Economy of Military Spending*. London: Routledge. 1991.

"Patterns of Congressional Influence In Defense Contracting." In Robert Higgs, ed., *Arms, Politics, and the Economy: Contemporary and Historical Perspectives*. New York: Holmes and Meier. 1990.

Other

"Campaign Finance: Some Basics." Prepared for the Bauer-Ginsberg Campaign Finance Task Force, Stanford University. September 2017. With Elizabeth M. Sawyer.

"The Wisconsin Recount May Have a Surprise in Store after All." *The Monkey Cage* (Washington Post), December 5, 2016. With Stephen Ansolabehere, Barry C. Burden, and Charles Stewart, III.

Review of Jason K. Dempsey, *Our Army: Soldiers, Politicians, and American Civil-Military Relations*. *The Forum* 9 (No. 3, 2011).

"Voting Early, but Not Often." *New York Times*, October 25, 2010. With Barry C. Burden.

Review of John Samples, *The Fallacy of Campaign Finance Reform* and Raymond J. La Raja, *Small Change: Money, Political Parties, and Campaign Finance Reform*. *The Forum* 6 (No. 1, 2008).

Review Essay, *Executing the Constitution: Putting the President Back Into the Constitution*, Christopher S, Kelley, ed.; *Presidents in Culture: The Meaning of Presidential Communication*, David Michael Ryfe; *Executive Orders and the Modern Presidency: Legislating from the Oval Office*, Adam L. Warber. In *Perspective on Politics* 5:635-637 (No. 3, September 2007).

"The Base Realignment and Closure Process: Is It Possible to Make Rational Policy?" Brademas Center for the Study of Congress, New York University.

2007.

"Controlling Executive Authority in a Constitutional System" (comparative analysis of executive power in the U.S. and Australia), manuscript, February 2007.

"Campaigns, Elections, and Campaign Finance Reform." *Focus on Law Studies*, XXI, No. 2 (Spring 2006). American Bar Association, Division for Public Education.

"Review Essay: Assessing The 2000 Presidential Election – Judicial and Social Science Perspectives." *Congress and the Presidency* 29: 91-98 (No. 1, Spring 2002).

Issue Briefs (Midterm Elections, Homeland Security; Foreign Affairs and Defense Policy; Education; Budget and Economy; Entitlement Reform) *2006 Reporter's Source Book*. Project Vote Smart. 2006. With Meghan Condon.

"Sunlight as the Best Disinfectant: Campaign Finance in Australia." Democratic Audit of Australia, Australian National University. October 2006.

"Return to the Norm," *Brisbane Courier-Mail*, November 10, 2006.

"The Return of the King? Presidential Power and the Law," *PRG Report* XXVI, No. 2 (Spring 2004).

Issue Briefs (Campaign Finance Reform, Homeland Security; Foreign Affairs and Defense Policy; Education; Budget and Economy; Entitlement Reform), *2004 Reporter's Source Book*. Project Vote Smart. 2004. With Patricia Strach and Arnold Shober.

"Where's That Crystal Ball When You Need It? Finicky Voters and Creaky Campaigns Made for a Surprise Electoral Season. And the Fun's Just Begun." *Madison Magazine*. April 2002.

"Capitol Overkill." *Madison Magazine*, July 2002.

Issue Briefs (Homeland Security; Foreign Affairs and Defense Policy; Education; Economy, Budget and Taxes; Social Welfare Policy), *2002 Reporter's Source Book*. Project Vote Smart. 2002. With Patricia Strach and Paul Manna.

"Presidential Emergency Powers." *Oxford Analytica Daily Brief*. December 18, 2001.

"An Analysis of the Issue of Issue Ads." *Wisconsin State Journal*, November 7, 1999.

"Background of Issue Ad Controversy." *Wisconsin State Journal*, November 7, 1999.

"Eliminating Public Funding Reduces Election Competition." *Wisconsin State Journal*, June 27, 1999.

Review of *Executive Privilege: The Dilemma of Secrecy and Democratic Accountability*, by Mark J. Rozell. *Congress and the Presidency* 24 (No. 1, 1997).

"Like Marriage, New Presidency Starts In Hope." *Wisconsin State Journal*. March 31, 1996.

Review of *The Tyranny of the Majority: Fundamental Fairness in Representative Democracy*, by Lani Guinier. *Congress and the Presidency* 21: 149-151 (No. 2, 1994).

Review of *The Best Defense: Policy Alternatives for U.S. Nuclear Security From the 1950s to the 1990s*, by David Goldfischer. *Science, Technology, and Environmental Politics Newsletter* 6 (1994).

Review of *The Strategic Defense Initiative*, by Edward Reiss. *American Political Science Review* 87:1061-1062 (No. 4, December 1993).

Review of *The Political Economy of Defense: Issues and Perspectives*, Andrew L. Ross ed. *Armed Forces and Society* 19:460-462 (No. 3, April 1993)

Review of *Space Weapons and the Strategic Defense Initiative*, by Crockett Grabbe. *Annals of the American Academy of Political and Social Science* 527: 193-194 (May 1993).

"Limits Wouldn't Solve the Problem." *Wisconsin State Journal*, November 5, 1992. With David T. Canon.

"Convention Ceded Middle Ground." *Wisconsin State Journal*, August 23, 1992.

"CBS Economy Poll Meaningless." *Wisconsin State Journal*, February 3, 1992.

"It's a Matter of Character: Pentagon Doesn't Need New Laws, it Needs Good People." *Los Angeles Times*, July 8, 1988.

Conference Papers

"Learning from Recounts." Presented at the Workshop on Electoral Integrity, San Francisco, CA, August 30, 2017, and at the 2017 Annual Meeting of the American Political Science Association, San Francisco, CA, August 31-September 3, 2017. With Stephen Ansolabehere, Barry C. Burden, and Charles Stewart, III.

"What Happens at the Polling Place: Using Administrative Data to Understand Irregularities at the Polls." Conference on New Research on Election Administration and Reform, Massachusetts Institute of Technology, Cambridge, MA, June 8, 2015. With Barry C. Burden, David T. Canon, Donald P. Moynihan, and Jake R Neiheisel.

"Election Laws and Partisan Gains: What are the Effects of Early Voting and Same Day Registration on the Parties' Vote Shares." 2013 Annual Meeting of the Midwest Political Science Association, Chicago, IL, April 11-14, 2013. Winner of the Robert H. Durr Award.

"The Effect of Public Funding on Electoral Competition: Evidence from the 2008 and 2010 Cycles." Annual Meeting of the American Political Science Association, Seattle, WA, September 1-4, 2011. With Amnon Cavari.

"What Happens at the Polling Place: A Preliminary Analysis in the November 2008 General Election." Annual Meeting of the American Political Science Association, Seattle, WA, September 1-4, 2011. With Barry C. Burden, David T. Canon, Donald P. Moynihan, and Jake R. Neiheisel.

"Election Laws, Mobilization, and Turnout: The Unanticipated Consequences of Election Reform." 2010 Annual Meeting of the American Political Science Association, Washington, DC, September 2-5, 2010. With Barry C. Burden, David T. Canon, Stéphane Lavertu and Donald P. Moynihan.

"Selection Methods, Partisanship, and the Administration of Elections. Annual Meeting of the Midwest Political Science Association, Chicago, IL, April 22-25, 2010. Revised version presented at the Annual Meeting of the European Political Science Association, June 16-19, 2011, Dublin, Ireland. With Barry C. Burden, David T. Canon, Stéphane Lavertu and Donald P. Moynihan.

"The Effects and Costs of Early Voting, Election Day Registration, and Same Day Registration in the 2008 Elections." Annual Meeting of the American Political Science Association, Toronto, Canada, September 3-5, 2009. With Barry C. Burden, David T. Canon, and Donald P. Moynihan.

"Comparative Election Administration: Can We Learn Anything From the Australian Electoral Commission?" Annual Meeting of the American Political Science Association, Chicago, IL, August 29-September 1, 2007.

"Electoral Transitions in Connecticut: Implementation of Public Funding for State Legislative Elections." Annual Meeting of the American Political Science

Association, Chicago, IL, August 29-September 1, 2007. With Timothy Werner.

"Candidate Gender and Participation in Public Campaign Finance Programs." Annual Meeting of the Midwest Political Science Association, Chicago IL, April 7-10, 2005. With Timothy Werner.

"Do Public Funding Programs Enhance Electoral Competition?" 4th Annual State Politics and Policy Conference," Akron, OH, April 30-May 1, 2004. With Timothy Werner and Amanda Williams.

"The Last 100 Days." Annual Meeting of the American Political Science Association, Philadelphia, PA, August 28-31, 2003. With William Howell.

"Hey, Wait a Minute: The Assumptions Behind the Case for Campaign Finance Reform." Citizens' Research Foundation Forum on Campaign Finance Reform, Institute for Governmental Studies, University of California Berkeley. August 2000.

"The Importance of Moving First: Presidential Initiative and Executive Orders." Annual Meeting of the American Political Science Association, San Francisco, CA, August 28-September 1, 1996.

"Informational vs. Distributive Theories of Legislative Organization: Committee Membership and Defense Policy in the House." Annual Meeting of the American Political Science Association, Washington, DC, September 2-5, 1993.

"Department of Defense Contracts, Presidential Elections, and the Political-Business Cycle." Annual Meeting of the American Political Science Association, Washington, DC, September 2-5, 1993.

"Problem? What Problem? Congressional Micromanagement of the Department of Defense." Annual Meeting of the American Political Science Association, Washington DC, August 29 - September 2, 1991.

Talks and Presentations

"How Do You Know? The Epistemology of White House Knowledge." Clemson University, February 23, 2016.

Roundtable Discussant, Separation of Powers Conference, School of Public and International Affairs, University of Georgia, February19-20, 2016.

Campaign Finance Task Force Meeting, Stanford University, February 4, 2016.

Discussant, "The Use of Unilateral Powers." American Political Science Association Annual Meeting, August 28-31, 2014, Washington, DC.

Presenter, "Roundtable on Money and Politics: What do Scholars Know and What Do We Need to Know?" American Political Science Association Annual Meeting, August 28-September 1, 2013, Chicago, IL.

Presenter, "Roundtable: Evaluating the Obama Presidency." Midwest Political Science Association Annual Meeting, April 11-14, 2012, Chicago, IL.

Panel Participant, "Redistricting in the 2010 Cycle," Midwest Democracy Network,

Speaker, "Redistricting and Election Administration," Dane County League of Women Voters, March 4, 2010.

Keynote Speaker, "Engaging the Electorate: The Dynamics of Politics and Participation in 2008." Foreign Fulbright Enrichment Seminar, Chicago, IL, March 2008.

Participant, Election Visitor Program, Australian Electoral Commission, Canberra, ACT. November 2007.

Invited Talk, "Public Funding in State and Local Elections." Reed College Public Policy Lecture Series. Portland, Oregon, March 19, 2007.

Fulbright Distinguished Chair Lecture Tour, 2006. Public lectures on election administration and executive power. University of Tasmania, Hobart (TAS); Flinders University and University of South Australia, Adelaide (SA); University of Melbourne, Melbourne (VIC); University of Western Australia, Perth (WA); Griffith University and University of Queensland, Brisbane (QLD); Institute for Public Affairs, Sydney (NSW); The Australian National University, Canberra (ACT).

Discussant, "Both Ends of the Avenue: Congress and the President Revisited," American Political Science Association Meeting, September 2-5, 2004, Chicago, IL.

Presenter, "Researching the Presidency," Short Course, American Political Science Association Meeting, September 2-5, 2004, Chicago, IL.

Discussant, Conference on Presidential Rhetoric, Texas A&M University, College Station, TX. February 2004.

Presenter, "Author Meets Author: New Research on the Presidency," 2004 Southern Political Science Association Meeting, January 8-11, New Orleans, LA.

Chair, "Presidential Secrecy," American Political Science Association Meeting, August 28-31,2003, Philadelphia, PA.

Discussant, "New Looks at Public Approval of Presidents." Midwest Political Science Association Meeting, April 3-6, 2003, Chicago, IL.

Discussant, "Presidential Use of Strategic Tools." American Political Science Association Meeting, August 28-September 1, 2002, Boston, MA.

Chair and Discussant, "Branching Out: Congress and the President." Midwest Political Science Association Meeting, April 19-22, 2001, Chicago, IL.

Invited witness, Committee on the Judiciary, Subcommittee on Commercial and Administrative Law, U.S. House of Representatives. *Hearing on Executive Orders and Presidential Power*, Washington, DC. March 22, 2001.

"The History of the Executive Order," Miller Center for Public Affairs, University of Virginia (with Griffin Bell and William Howell), January 26, 2001.

Presenter and Discussant, Future Voting Technologies Symposium, Madison, WI May 2, 2000.

Moderator, Panel on Electric Utility Reliability. Assembly Staff Leadership Development Seminar, Madison, WI. August 11, 1999.

Chair, Panel on "Legal Aspects of the Presidency: Clinton and Beyond." Midwest Political Science Association Meeting, April 15-17, 1999, Chicago, IL.

Session Moderator, National Performance Review Acquisition Working Summit, Milwaukee, WI. June 1995.

American Politics Seminar, The George Washington University, Washington D.C., April 1995.

Invited speaker, Defense and Arms Control Studies Program, Massachusetts Institute of Technology, Cambridge, MA, March 1994.

Discussant, International Studies Association (Midwest Chapter) Annual Meeting, Chicago IL, October 29-30, 1993.

Seminar on American Politics, Princeton University, January 16-17,1992.

Conference on Defense Downsizing and Economic Conversion, October 4, 1991, Harvard University.

Conference on Congress and New Foreign and Defense Policy Challenges, The Ohio State University, Columbus OH, September 21-22, 1990, and September 19-21, 1991.

Presenter, "A New Look at Short Term Change in Party Identification," 1990 Meeting of the American Political Science Association, San Francisco, CA.

University and Department Service

Athletic Board, 2014-present.
General Education Requirements Committee (Letters and Science), 1997-1998.
Communications-B Implementation Committee(Letters and Science), 1997-1999
Verbal Assessment Committee (University) 1997-1998.
College of Letters & Science Faculty Appeals Committee (for students dismissed for academic reasons).
Committee on Information Technology, Distance Education and Outreach, 1997-98.
Hilldale Faculty-Student Research Grants, Evaluation Committee, 1997, 1998.
Department Computer Committee, 1996-1997; 1997-1998, 2005-2006. Chair, 2013-present.
Faculty Senate, 2000-2001, 2001-2002, 2002-2005. Alternate, 1994-1995; 1996-1999; 2015-2016.
Preliminary Exam Appeals Committee, Department of Political Science, 1994-1995.
Faculty Advisor, Pi Sigma Alpha (Political Science Honors Society), 1993-1994.
Department Honors Advisor, 1991-1993.
Brown-bag Seminar Series on Job Talks (for graduate students), 1992.
Keynote speaker, Undergraduate Honors Symposium, April 13 1991.
Undergraduate Curriculum Committee, Department of Political Science, 1990-1991; 1991-1992; 1993-1994.
Individual Majors Committee, College of Letters and Sciences, 1990-1991.
Dean Reading Room Committee, Department of Political Science, 1989-1990; 1994-1995.

Teaching

<u>Undergraduate</u>
Introduction to American Government (regular and honors)
The American Presidency
Campaign Finance
Election Law
Classics of American Politics
Presidential Debates
Comparative Electoral Systems
Legislative Process
Theories of Legislative Organization
Senior Honors Thesis Seminar

<u>Graduate</u>
Contemporary Presidency
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Legislative Process